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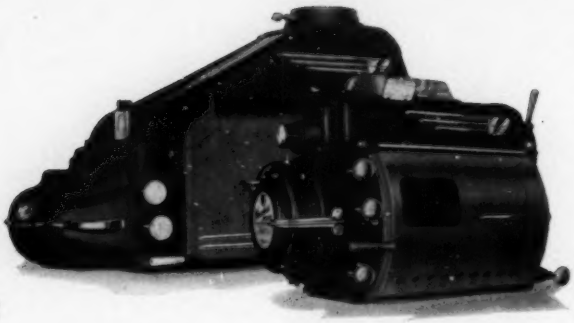

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INTERNATIONAL PROJECTIONIST

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HENRY B. SELLWOOD, *Editor*

Volume 26 DECEMBER 1951 *Number* 12

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MONTHLY CHAT

COMES now the turn of a year which ushers in a period during which the motion picture industry, and particularly the exhibition end, will have to make decisions which could well determine whether the industry will continue to exist as we have known it for these many years. Production and distribution will also be mightily affected by the turn of events within the next twelve months, but their problems are picayune by comparison with those which face the exhibition end.

Time was when this industry we so loosely termed "the picture business" operated under one big tent, so to speak. But, alas, no more: the canvas has been rent and well-nigh ripped to tatters by many forms of competition for the leisure time and amusement dollar of the populace.

Home television is rated the No. 1 competitor of the movie theater. But there are many others: straightaway radio shows, gin rummy, bridge, parlor tippling, *etc.*, which have zoomed the stay-at-home total. Collectively this is tough competition, of course, but it is remarkable how these competitive forces are dispersed when a really good movie hits the theater screen.

Admittedly not all movies released to theaters rate an A-1 classification. Neither do the majority of radio shows, despite top writing, directorial and acting talent. As for home Tv today, it is no exaggeration to say that 90% of its output is outright trash. Yet home Tv continues to hold and to *build* its audience. The significance of this fact to us is that the movie industry is standing still technologically and is doing nothing to resist Tv's inroads on its business, much less to *regain* its lost customers.

This old refrain has been sung in this space on many occasions. But unless drastic changes are effected in the taking and showing of motion pictures within the next 12 months, we think that some 75% of movie theaters will have so few customers as to make their operation not only unprofitable but prohibitive.

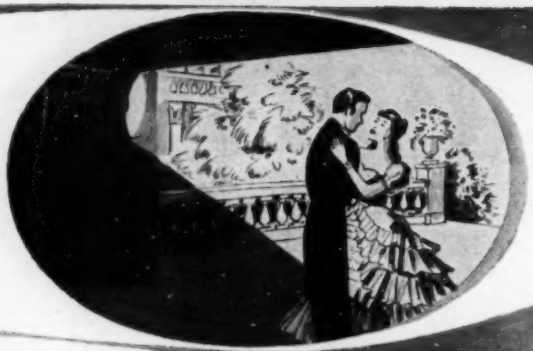
What to do? Why, just take some of these terrifically inflated star (?) and executive (?) salaries, plus other monetary folerol, and plough it back into the erection of a solid technological foundation—as did the smart radio and Tv boys. We repeat: vastly improved color, truly stereophonic sound reproduction, and, yes, an approximation at least of three-dimensional movies are available for a tithe of the money that is now being poured down the drain on the superfluous fringe of the industry.

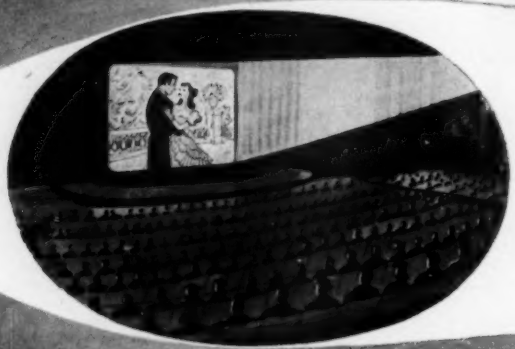
Failing to take these positive steps forward, 1952 may well prove not a milestone but a tombstone for a majority of movie theaters.

Glum words, these, but we have an idea that, lacking forthright and vigorous action, they will prove to be prophetic—and with a vengeance.

On movie sets...

BETTER MOVIES!





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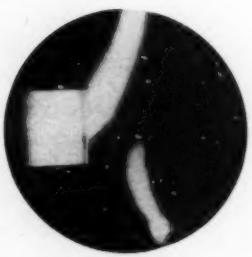

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INTERNATIONAL PROJECTIONIST

VOLUME XXVI DECEMBER 1951 NUMBER 12

Projectionist's Role as a Showman

By ROBERT A. MITCHELL

Second in a series of articles which detail helpful technical hints anent the preparation for and projection of a good theater motion picture show.

MOST theaters have footlights and two curtains—grand drape and title curtain—which can be controlled from the projection room. When the footlights are split up into two or more separate circuits, each circuit controlling bulbs of one color, a real opportunity is provided for "dressing up" the openings. If the stage is also equipped with overhead striplights operated from dimmers, the projectionist can "go to town" with openings and intermissions.

Facilities for controlling auditorium and stage lighting vary. The worst possible setup, from the standpoint of showmanship, is the theater which lacks curtains, footlights, and a dimmer for the houselights: the projectionist must start the show "with a bang," flashing the picture on the bare screen at the same instant the houselights are turned off—the nickelodeon-style opening. With more elaborate arrangements, the projectionist must have his routine worked out to avoid a clumsy opening.

For an Effective Opening

The projectionist should study the situation carefully and "dream up" an effective opening. A bit of experimenting will pay rich dividends. In general, the routine is as follows in a theater equipped with non-sync, two curtains, footlights, and houselights dimmer:

1. Non-sync playing music appropriate to the screen attraction. Both curtains closed, houselights and footlights on.
2. Film in the "first" projector run down a few inches past the "3" frame of the leader. Changeover shutter open, sound fader off, or switched over to the "second" projector.
3. Sound amplifier will be operating, of course; but if there is no non-sync, the amplifier will be turned on a few minutes before the opening.
4. Arc generator or rectifier turned on about 4 minutes before the opening. Arc of "first" projector struck and allowed to "burn in" for 3 minutes if low-intensity, 1 minute if high-intensity, before starting time.
5. STARTING TIME. The grand drape is now opened, and the houselights are slowly dimmed and extinguished. (The auditorium is not in darkness, for the footlights gleam on the title curtain, focusing attention upon the stage.)
6. Projector started, lamphouse douser opened to flash the title on the curtain.
7. *Immediately* the title curtain is opened, sound faded from non-sync to projector, and footlights turned off. The show is now underway.

Variations of Procedure

A number of variations of this 7-step procedure will at once suggest themselves. For example, in some theaters the arrangement of sound faders may make it desirable to turn off the footlights *before* changing from non-sync to sound-on-film. In other theaters, it may be best to have the fader set to the incoming projector—it depends entirely upon local conditions and the way the sound wiring is hooked up.

Clumsy hookups outnumber the convenient ones, thus requiring quite a bit of hopping around by the projectionist. Intolerably clumsy hookups should be corrected, even if local electricians and the sound serviceman have to be called in to advise and assist with the changes.

Also, the places in the aforementioned procedure where speed is advisable will be apparent. Overall, however, the process is a leisurely one, but with no standstill at any time. *Something* must be "happening" all the time—a curtain opening, or lights dimming, *etc.* For this reason, the incoming projector should be started up when the grand drape is about halfway open. By the time it has opened nearly all the way, the picture may be flashed onto the title curtain by opening the lamphouse douser.

On the other hand, to open both curtains, flash the picture on, and turn off all lights simultaneously is too hurried a technique to be good showmanship. If you have all the facilities for an impressive opening, get the most good out of them.

Although real showmanship avoids unnecessary flourishes, the addition of a colored spotlight effect on the curtains sometimes helps when there is only one footlight circuit, or no footlights at all. After a definitely pleasing opening routine has been worked out, it should be rehearsed until it can be performed perfectly.

Projection of Titles, Credits

Much debated is the running of *all* the "titles" of a film—credit captions included—on the title curtain, not opening this curtain until the first scene of the picture appears. Some projection-

ists believe that this practice contributes additional "dress" to the performance; others hold that audiences prefer to see the titles on the screen instead of wording more or less garbled by the folds and colored designs of a curtain. A somewhat similar matter of debate is color-flooding the titles of each new subject by means of colored footlights, striplights, *etc.*

Extreme points of view are advocated by the "fundamentalists" and the "esthetes" of the projection brotherhood. The former would dispense with all frills, once a show is in progress, and make changeovers from subject to subject without using the title curtain or any lighting effects; they prefer to avoid all "fancy tricks" and run their shows straight. The esthetes, on the other hand, are the poets of the craft. They never miss an opportunity to "shoot the works," even to the extent of momentarily shutting down the projectors between film-subjects while curtains open and close to the accompaniment of varicolored lights.

There is something to be said for both viewpoints. Each has its advantages and disadvantages. This suggests a middle path to be followed in the average theater, a path which permits considerable flexibility of presentation technique.

Middle Course Advocated

For the average theater the "straight run" is too "commercial" and impersonal; while overly complicated bedazzlements inserted in the show are likely to exhaust the patience of suburban audiences and cause steady patrons to poke fun at the bombastic goings-on. A happy medium must be found; and the safest rule that the writer can think of is this:

Any presentation technique which irritates and annoys the "kids" who attend a particular theater is somewhat too complex to be suitable for that theater. A child's *intuitive* tastes are far superior to an adult's *acquired* tastes. And a kid offers his opinions freely and frankly.

The middle path would therefore appear to consist of an impressive opening of the show and a minimum of interruption during its progress. Superfluous interposition of curtains should be eliminated, and color-flooding of titles avoided for the most part. (The titles of natural-color films should *never* be color-flooded!) Likewise, decorative lighting on or near the stage should be reserved for openings and intermissions and not allowed to distract the attention of patrons while a picture is being shown.

The title curtain, being made of light-colored material, should be closed and *immediately* opened again between subjects; but the footlight and striplights should not be used except on special occasions when color-flooding is deemed desirable. Special color effects are best reserved for the showing of trailers, most of which can well stand a little dressing up these days in the absence of tinting and toning thereon.

Deficiencies of Trailers

Some of the trailers we receive these days are unfit for showing in a first-class theater. "Open," "close," and date strips are of poor quality, carelessly made and evidently the product of innumerable reprintings. They jump and rock on the screen, are "fuzzy" in image definition, contain black or incomplete frames, and are not long enough or furnished in sufficient quantity enable the projectionist to abandon splicing parts of two or three of them together. The evil of mid-frame splices is also directly attributable to insufficient supplies of date-strip films.

Theater managements are urged to consider the use of "tailor-made" film strips which are tastefully and beautifully designed and which include the name of the theater in the "open" and "close" coming-attraction strips. A large number of companies specializing in trailer material can make "titles" at low cost, even when animated lettering is desired. This is a matter worth investigating, as the use of inferior title strips is not good showmanship.

Lighting the Stage Show

Stage entertainment, be it a mere "cash night" conducted from the stage or an elaborate vaudeville bill, calls for real showmanship on the part of the projectionist if spotlight operation and manipulation of stage lighting are included in his duties. He should learn beforehand exactly what is expected of him, study his cue-sheet carefully, and give considerable thought to producing a professionally smooth transition from movies to stage. Necessary adjustments in the spotlight should be made before the show, and, as a rule, the spotlight ought to be set up for the first "effect" required, as regards the size of the spot, the color, and position on the stage.

When the "performance" is nothing more complicated than the manager or master-of-ceremonies appearing on the stage to give an announcement or to conduct an audience-participation program of some sort, have the spot directed at the left-hand end of the stage where the master-of-ceremonies will first appear; then "follow" him to the center of the stage. This seems much better than forcing him to "walk into" a spot directed first to the center of the stage.

In such cases the spot should be just a little larger than is necessary to include the master-of-ceremonies' whole figure. It should be remembered that when someone appears on the stage, the audience wishes to get a good look at him from head to toes. If he introduces another speaker, the spot should be enlarged momentarily, and not reduced until the new speaker is alone on the stage.

Spotlight Colors Important

If a singer or instrumentalist is introduced, white foot- and strip-lights should be turned on, and the widened spot colored pink or amber, the latter color being preferable when the performer is male. Then when the performer "goes into his act," the spot should be turned back to white, reduced in size, and the footlights changed to a suitable color. (Green and blue are colors which should be avoided when using the spotlight on a single person, as these two hues discolor the complexion, even when makeup is used. Special "acts" may call for any color of spot, however.)

When a motion picture program is in progress there is always the possibility, however slight, that something may go wrong. With equipment properly maintained and prints adequately repaired, this possibility need cause no concern; but it exists nevertheless. Perhaps the

(*Continued on page* 42)

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*Meets SMPTE Specifications for sound transmission for motion picture screens.

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TABLE 1. Characteristics of Carbon Arc and Incandescent Tungsten Studio Lamps

Lamp	Light Source	Fresnel Lens Diam.	Beam Spread	For 10% of Center Intensity	For 50% of Center Intensity	Apparent Candle Power at Center of Beam	Beam Lumens*	Approximate Apparent Source Size-Inches** Visual	Photometric
Carbon Arc Lamps									
Type 450 "Brute"	225 amp. 16mm Carbon	24"	Minimum Spot	12°	5°	10,000,000	117,000	23.5	13.3
			Flood	48	35	1,000,000	260,000	4.1	3.4
Type 170	150 amp. 16mm Carbon	20"	Minimum Spot	10	4.4	5,700,000	47,000	19.5	9.7
			Flood	48	42	300,000	130,000	1.8	1.2
Incandescent Tungsten Lamps									
Type 414 "Senior"	5KW bulb	14	Minimum Spot	13	8	1,050,000	18,000	13.3	8.3
			Flood	45	36	120,000	37,500	3.6	3.0
Type 410 "Junior"	2KW bulb	10	Minimum Spot	12	8	420,000	6,900	9.0	5.7
			Flood	44	39	40,000	14,000	2.8	2.2

*Boundary Intensity 10% of center intensity.

**Horizontal dimension as viewed visually and as measured photometrically from the beam through the Fresnel lens.

Movie Studio Carbon Arc Lighting

Small Source Size, High Brightness and High Unit Power in Producing Daylight-Quality Light Render it Superior in Penetration and Area Coverage, and in Shadow Sharpness.

By HENRY B. SELLWOOD

CARBON arcs have been for many years the dominant studio light source for motion picture photography. They are used extensively in black-and-white photography, and until very recently, at least, they were practically the sole light source for Technicolor and other 35-mm three-color processes. The widespread industry interest generated by Technicolor's recent development of a more sensitive negative film combination intended for use with light of 3350 K. color quality, suggests another look-see into the technical aspects of carbon arc as contrasted with incandescent ("inkie") lighting.

Studio light sources have a direct relation to theater projection in terms of the old adage: "If picture quality isn't on the film, one can't put it on the screen."

Basis for this discussion are the arc and incandescent spotlamps shown in Table 1. The optical system used with carbon arcs is shown in Fig. 1. The incandescent lamp optical system differs only in the addition of a spherical mirror positioned behind the light source to gather otherwise lost radiation and direct it back through the source and into the useful beam.

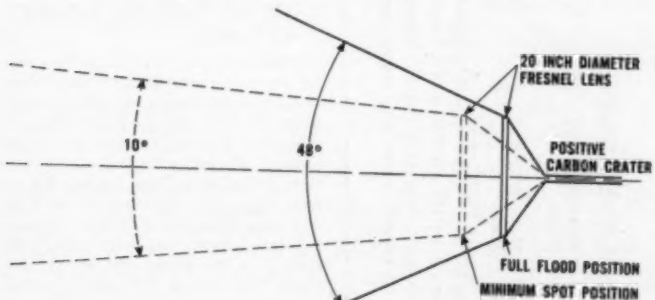


FIGURE 1. Optical system of the Type 170 lamp.

Carbon Arc Optical System

The carbon arc optical system affords a wide range of beam spreads from 10-13° at minimum spot to 44-48° at full flood. Total lumens in the beam at various beam spreads are shown in Table 1. At full flood the closer spacing of the lens from the light source gives a greater pickup of light than at minimum spot.

At a single beam spread, the light intensity varies approximately as the inverse square of the distance from the lamp. It is thus possible to assign for each beam spread an apparent candlepower value which can be divided by the square of the distance to obtain the intensity at any distance. Data bearing on this point, as compiled by Mole-Richardson Co.,* are given in Table 1. The greater concentration of the beam at minimum spot more than offsets the smaller light collection, and results in greater beam candlepower than at wider beam spreads.

The color quality of the light source is a paramount consideration in motion picture photography.** This quality in a high-intensity carbon arc makes it suitable directly or with only minor filtering

* Arclamp manufacturer, Hollywood, Calif.

** See "Color Temperature: Origin and Meaning," by W. W. Lozier; IP for Nov. 1947, p. 5.

TABLE 2. Lamp Performance for Equivalent Photographic Effect at the Center of the Beam with Various Types of Color Film

Lamp	Beam Spread	Projection Distance — Feet			Range of Projection Distance for ±20% Variation of Light Intensity			Beam Diameter*** — Feet			Apparent Angle Subtended by Light Source — Degrees****		
		150 Foot-Candle 3350°K. Film *	300 Foot-Candle Daylight Film **	450 Foot-Candle Daylight Film **	150 Foot-Candle 3350°K. Film *	300 Foot-Candle Daylight Film **	450 Foot-Candle Daylight Film **	150 Foot-Candle 3350°K. Film *	300 Foot-Candle Daylight Film **	450 Foot-Candle Daylight Film **	150 Foot-Candle 3350°K. Film *	300 Foot-Candle Daylight Film **	450 Foot-Candle Daylight Film **
Carbon Arc Lamp													
Type 450 "Brute"	Minimum Spot	182	173	141	36.4	34.6	28.2	38.3 (15.9)	36.4 (15.1)	29.7 (12.3)	.35	.37	.45
	Flood	58	55	45	11.6	11.0	9.0	51.3 (36.6)	49.0 (34.7)	39.8 (28.2)	.28	.30	.36
Type 170	Minimum Spot	138	131	107	27.6	26.2	21.4	24.2 (10.6)	22.9 (10.1)	18.7 (8.2)	.34	.35	.43
	Flood	32	30	24	6.4	6.0	4.9	28.2 (24.4)	26.7 (23.0)	21.7 (18.7)	.18	.17	.24
Incandescent Tungsten Lamps													
Type 414 "Senior"	Minimum Spot	84	37	31	16.7	7.5	6.1	19.1 (11.7)	8.5 (5.3)	7.0 (4.3)	.47	1.06	1.30
	Flood	28	13	10	5.6	2.5	2.0	23.4 (18.4)	10.5 (8.3)	8.5 (6.7)	.51	1.13	1.39
Type 410 "Junior"	Minimum Spot	53	24	19	10.6	4.7	3.8	11.2 (7.4)	5.0 (3.3)	4.1 (2.7)	.51	1.15	1.41
	Flood	16	7	6	3.2	1.4	1.2	13.2 (11.5)	5.9 (5.2)	4.8 (4.3)	.64	1.44	1.75

*Types 450 and 170 with filter of 50% transmission; Types 414 and 410 unfiltered.

**Types 450 and 170 with filter of 90% transmission; Type 414 and 410 with filter of 40% transmission.

***Values in parentheses are for boundary intensity of 50% of center; others are for boundary intensity 10% of center.

****The sun subtends an angle of 0.5 degrees; sources smaller than this will produce sharper shadows and those larger will produce fuzzier shadows.

when shooting with color film balanced for daylight. With film balanced for lower color temperatures, more red than green, and more green than blue, light is required, thus a white light source when used with such film must have a substantial portion of its blue and green content removed.

As an example, with a black body at 3350° K., the blue content is exceeded by the green content by about twice, and by the red content about three times. Matching this radiation with a white light source, or one with approximately equal energy at all wavelengths, requires filtering of an order which will diminish by at least two-thirds the blue content and by one-third the green radiation inherent in the light source. This filtering represents a theoretical light loss of about one-third.

With color films definitely on the upswing, the following summary of the present state of the art relative to particular types of color film should prove of interest.

1. 150 Foot-Candle Film Balanced for 3350° K.

As a complementary to this discussion, the assumption here is that a deep amber filter of about 50% foot-candle transmission will serve to utilize carbon arc light for this type of film. The type of gelatin filter combination now being used with Technicolor film of this type matches these characteristics; however, a much higher degree of light transmission is quite possible, as aforementioned. Also directly suitable for this are inkies of the proper color temperature.

2. 300 Foot-Candle Film Balanced for Daylight

Present studio practice, based on extensive tests, indicate that a light yellow Y-1 filter effecting 90% light transmission will enable the use of carbon arclamps with this film. By way of contrast, incandescent lamps of 3350° K. color temperature must utilize deep blue filters having only about a 40% light transmission value.

3. 450 Foot-Candle Film Balanced for Daylight

Penetrating power, which makes possible the projection of *useful* light intensities from great distances with a single lamp, has long been an outstanding advantage of the studio carbon arc studio lighting. Projectionists well understand that, with a given lamp setting, the inverse square law dictates that the light decrease rapidly with increasing distance.

Now, it follows that if a lamp be placed close to a set having any appreciable depth, the ensuing light intensity will vary en route across the set. There is only one answer to this problem—a light source with enough penetrating power to

permit its positioning farther away from the set so that set depth becomes a *smaller fraction* of the projection throw.

This penetrating power (projection throw) of the different lamps *for the same photographic effect* at the center of the beam is indicated in Table 2. These data show the distances at which the lamps considered, with proper filtering, will project 150, 300, and 450 foot-candles of light intensity for the three types of film mentioned previously.

Intensities at Given Throw

Now we come to the crux of this presentation. Table 2 shows that with the beam spread adjusted for minimum spot, the indicated intensities will be projected about three times as far as when the lamp is set for full flood. We see here that at minimum spot the most powerful carbon arc will project the indicated intensities more than 180 feet for the 150 foot-candle film, and more than 170 feet for the 300 foot-candle film.

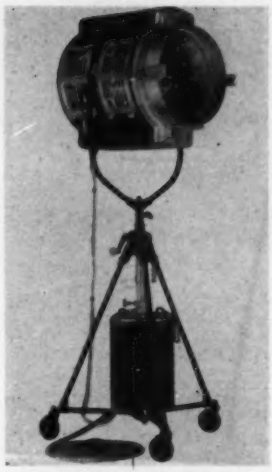
By way of contrast, it will be noted the most powerful inkie tungsten lamp (the "Senior") is much lower in penetrating power than the most commonly used arc-lamp, the Type 170, when used with the 3350° K. type film. Where the carbon arc and the inkie emphatically part company, to the distinct advantage of the former, is with the use of the 300 and the 450 foot-candle daylight film, by reason of the more favorable filter factors. In this category none of the inkie lamps even approach the light output of *any* of the carbon arcs.

Table 2 also shows the requisites for coverage of depth of set—that is, the range of projection distance which can be effectively lighted within plus or minus minus 20% of the specified light intensity in a given case. It is seen that the more powerful carbon arc lamps and the small beam spreads are required to achieve this degree of light uniformity on sets deeper than 25 feet. It is always possible, of course, to use a number of lesser-intensity units at the same distance to attain the equivalent light uniformity across the set; but this procedure might sometimes result in undesirable multiple shadows.

Area Covering Power

Covering power is another vitally important factor in studio set lighting. This term applies to the area of a set which can be lighted to a given intensity with a single lamp, and may be defined in terms of the diameter of the spot over which this intensity can be obtained. The diameter of the spot, of course, is dependent upon the *projection throw* and the *beam spread*.

In this important respect the carbon arc exhibits marked superiority over any other light source, because of the high



M-R TYPE 170 ARC SPOTLAMP

showing 24-inch diameter Fresnel-type lens and series resistance unit. This lamp uses a 16-mm rotating H. I. studio positive carbon and a ½-inch studio negative carbon at 140-180 amperes.

lumen content of the light beam it produces.

When the term "boundary light" is used in motion picture photography, it is taken to mean the point where the projected light intensity is 10% of that at the center of the set. However, not infrequently more than 10% of the maximum center intensity may be required in certain cases, thus Table 2 shows covering power values for boundary intensities of 50% of the center set value.

The foregoing definition of covering power is applicable for the figures given in Table 2 for the lamps and film conditions considered previously. It is apparent from Table 2 that the carbon arc lamps at minimum spot can effectively cover set widths ranging from 10 to 40 feet on the basis of a 10% boundary intensity—which coverage is in sharp contrast to that of inkies which are limited to about one-half of this. For a 50% boundary light intensity, the carbon arc at minimum spot coverage is about one-half to two-thirds as much as it is for the 10% level.

Full Flood Position Best

Much greater covering power is obtainable with the carbon arc at full flood than at the minimum spot position, because of the greater lumen output at the flood position. Also, the covering powers of the 50% and the 10% boundary intensities are more nearly identical at full flood, the result of a more uniform distribution of light across the wider beams.

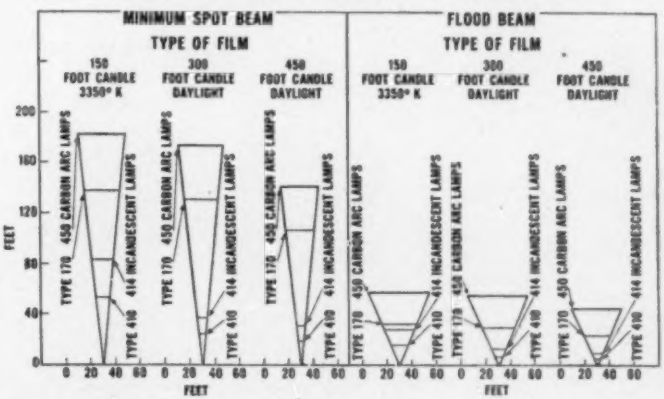
Set areas which can be illuminated to a given intensity will naturally depend upon the square of the corresponding beam diameters shown in Table 2. It is not possible to specify these areas even in a general way, since the angle at which the light beam strikes a given set is dependent upon the particular effect desired.

Figure 2 is a scale diagram of data from Tables 1 and 2 showing the penetrating power, beam diameter and beam spread of the various carbon arc and inkie lights. This graphically portrays the outstanding ability of carbon arc lamps to project over long distances and to cover large set areas.

Shadow Formation, Structure

The formation and structure of shadows formed by a light source, as shown in Fig. 3, is a subject for unending exploration by lighting technicians. That

FIGURE 2. Scale diagram showing projection distance, beam spread and beam diameter for equivalent photographic effect at center of beam.



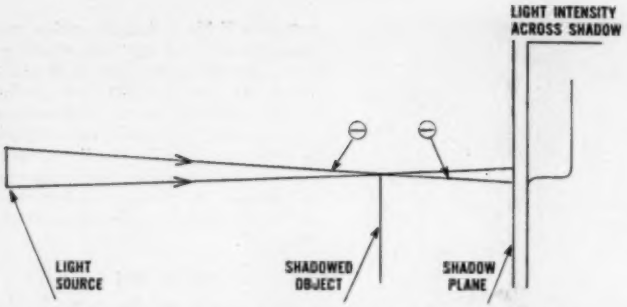


FIGURE 3. Showing how the sharpness of shadows depends on angle subtended by the light source at the shadowed object.

degree of sharpness which is cast by the various lamps is determined by the source size and is measured by the apparent angle subtended by the *effective portion* of the light source at the object producing the shadow.

As is evident from Fig. 3, the area over which the shadow varies from complete darkness to full-light intensity will be smaller and the shadow sharper when the angular extent of the light source (θ) is as small as possible.

Characteristically, only a small portion of the lamp lens surface is effective in illuminating a single area in the beam when the lamp is adjusted for wide beam spreads; but when the lamp is set for narrow beam spreads, a larger portion of the lens surface becomes luminous. It follows, therefore, that when the lamp is adjusted for full flood, the shadows of objects placed at the same distance from the lamps will be sharper than when the lamp is adjusted for minimum spot.

The effective horizontal dimensions of the sources for the extremes of beam spread for each lamp were measured as shown in Table 1. These were determined both visually and by recording the intensity across the shadow of an opaque straight edge. Photometrically, effective source sizes were based upon the width of shadow between the points at which the light intensity was 10 and 90% of the unshadowed intensity.

Source Sizes Factor

The source sizes so determined were found to be smaller than those visually observed (Table 1) and are believed to be a better measure of shadow sharpness. The edges of the luminous spot on the lens surface are not sharply defined, the light tapering downward over a band width which is difficult to define with the eye alone.

Thus, although the entire area of the Fresnel lens appears visually luminous at minimum spot, much of the outer area is of relatively low brightness and is essentially ineffective in contributing to shadow formation.

With the 150 foot-candle balanced film, the arc lamps produce up to 50% sharper shadows than the inkies at minimum spot, and as much as three-fold sharper shadows at 45° flood. Because of heavy filtering and close projection distances necessary to get required intensities, both daylight films result in pronounced poorer sharpness of shadows with inkies (larger source sizes).

Table 2, shows that *all* the carbon arc lamps at *all* conditions produce a shadow sharpness essentially equivalent to or sharper than the sun. As previously indicated, much sharper shadows are produced at full flood than at minimum spot. The small source size and the high brightness of the carbon arcs enable them to produce *useful* intensitities of radiation with a shadow sharpness surpassing that obtained from the sun and from other studio lighting sources.

Thermopile measurements of the total radiant energy from the carbon arcs show that the unfiltered lamps have a luminous efficiency of approximately 75 to 100 lumens per watt in the beam. Similar measurements using a gelatin filter combination wtih one MT-1 and two Y-1 filters resulted in approximately 50% loss in visual candlepower, but correspondingly reduced the total radiant energy, so that there was only a 10 to 20% loss in luminous efficiency. This filter combination is the one presently used with carbon arcs and 3350° K. film.

Inkie tungsten lamps used for studio lighting are reported to have a luminous efficiency of 35-40 lumens per watt. With or without the gelatin filter combination on the arcs, the luminous efficiency of carbon arc lamps is thus at least twice that with tungsten, to give half the heat for the same light intensity. This explains the much greater coolness conventionally associated with carbon arc light, and indicates that this advantage is maintained with the gelatin filter combinations and the new color films.

It is interesting to note that the carbon arc lamp approaches the sun in luminous efficiency as well as in color quality, the solar efficiency being approximately 100 lumens per watt.

Summarization

The small source size, high brightness and high unit power of the carbon arcs make possible their outstanding superiority in penetrating power, covering power and shadow sharpness, compared to other available light sources. The daylight quality of the light is responsible for the coolness of the radiation and permits ready interchangeability with daylight in color photography.

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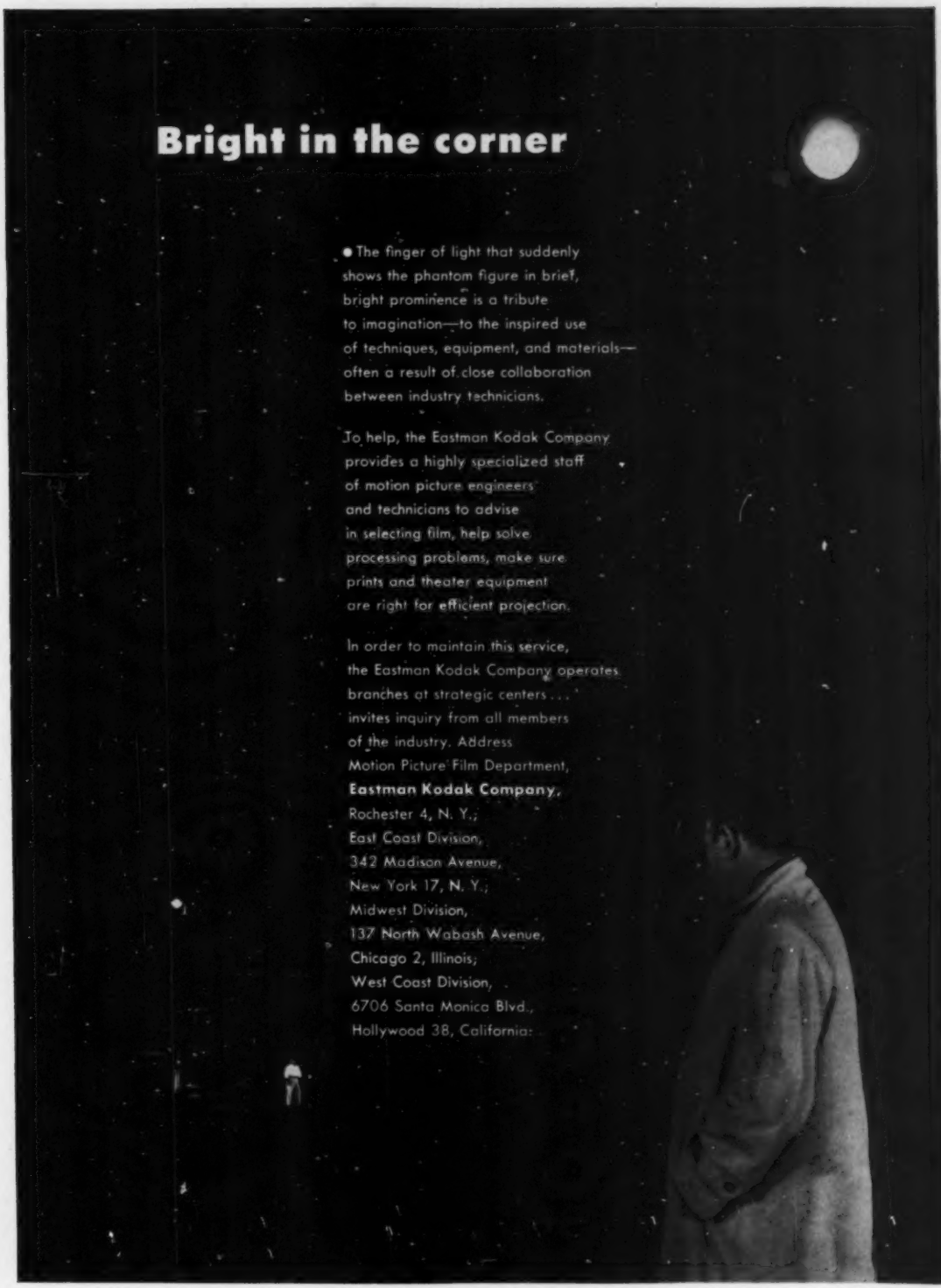

Bright in the corner

● The finger of light that suddenly shows the phantom figure in brief, bright prominence is a tribute to imagination—to the inspired use of techniques, equipment, and materials—often a result of close collaboration between industry technicians.

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IV. Photographic Optics (Conclusion)

Bausch & Lomb Optical Company, Rochester, New York

IN THE discussion of the pinhole camera we were apprised of the disc which takes the place of our ideal image point, and further we found that we cannot perceive a disc of about 3/1000th inch as a disc, but we see it as a point. It was said there that this disc image permitted pictorial photography, in that it is responsible for depth of field.

To see this, consider the path of rays near the focal point. It is evident that a certain displacement is possible in the focal plane without exceeding the disc size. Throughout this range the subject remains substantially in focus, and, conversely, objects on either side of the subject focused upon are in apparent focus. This depth in the object space is called *depth of field*, contrasting with the depth of focus in the image space.

(These two terms are often confused. Strictly, the distance between the farthest and nearest *object* planes in acceptable focus on the film is defined as depth of field. The separation between their points of focus near negative or image is the depth of focus. Fig. 27).

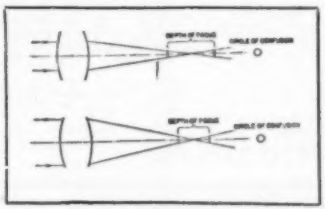

FIG. 27. Depth of field and aperture.

The Hyperfocal Distance

If our lens is focused on infinity, obviously there will be a finite distance represented in focus on the screen. This distance bears the name of the *hyperfocal distance*, and is of great importance in depth of field computations.

The hyperfocal distance has a very interesting property: if a lens is focused on the hyperfocal distance, then everything from half that distance to infinity will be in focus. The depth of field is at that point the maximum attainable. The lenses in fixed focus cameras are set for the hyperfocal distance, for then the maximum usefulness will be attained. Many movie camera lenses are also set for hyperfocal distance.

A few of the depth-of-field relations are easily seen from a serious study of the diagrams. Thus: the smaller the stop, the greater the depth with a given lens; the far depth is greater than the near depth; the depth decreases with decreasing object distance, so that focusing is more critical at short distances; with a given object distance, the depth is greater with a shorter focal length—for this reason miniature cameras show advantages in depth of field over their bigger brothers.

Supplementary Optics

The use of supplementary lenses permits the attainment of effects impossible with the camera lens provided by the manufacturer. A battery of simple lenses, judiciously used, is equivalent to a collection of objectives. However, there are certain precautions to observe in order to derive the utmost in satisfaction from these lenses.

Either positive or negative lenses can be used as supplementaries, if the camera has considerable bellows extension. If, on the other hand, the lenses are to be used with single-extension bellows cameras or with fixed focus cameras, only the positive lens type will be suitable.

Perhaps the most generally useful supplementary lens is a simple positive lens, for it can serve both as a wide angle lens or as a portrait or tabletop attachment. These lenses come in various powers, 3 diopters being about the maximum useful. (One diopter of lens power is possessed by a lens of 1 meter—39.37 inches—focal length; in general the power in diopters of a lens is found by dividing

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its focal length in meters into 1. For example, a 2-meter lens has a power of one half diopter, a 500 millimeter lens a power of two diopters.)

Use of Two Positive Lenses

When a positive lens is used with another positive lens, the power of the combination is equal closely to the sum of the individual powers. Thus our positive supplementary lens increases the power of the camera lens; or, expressed differently, we have converted our camera lens into a shorter focal length lens. With a fixed focus objective on our camera, this means the possibility of making pictures of near objects, their distance determined by the focal length of the combination and the focal length of the original lens.

If we have a camera with bellows, we have another possibility—the use of our supplementary as a wide-angle lens. We have noted that the angle of view embraced in a negative is determined by the focal length of the objective with respect to the film size. Since our positive supplementary shortens the focal length of our camera lens, it becomes then a wide-angle lens, and can be used as such.

A negative supplementary can be used only with a camera having a bellows extension greater than normal, for it will effectively increase the focal length of the lens, serving as a substitute for a telephoto lens.

In the use of these lenses, it is necessary to correct for the effect of the lens on the stop markings. Since the effective relative aperture is given by the ratio of the lens-to-film distance to the lens opening, when that distance is altered the stop value is accordingly changed, so that the exposure will no longer be given directly by the diaphragm markings.

Heavy Aberrations Result

These effects, of course, are the more pronounced the stronger the supplementary, as are the defects of these lenses. Indeed, the heavy aberrations introduced by these lenses limit the useful powers to comparatively modest limits.

Our camera objectives are carefully designed so that they deliver the best sort of image most economically, and are corrected to work alone, and theoretically at one range of object distances, usually including infinity. Now, if we were to place in front of our lens another, we would inevitably upset these corrections.

Not too much relief is possible in the design of the supplementaries, since they must be reasonably priced. For this reason a delicate balance is achieved between the corrections best for a wide variety of camera objectives, and the cost of perfection. These lenses must be used with caution, and at a small aperture to minimize the effects of the aberrations causing unsharpness. Of course, no relief is possible in this way for the aberrations independent of aperture: astigmatism, distortion, and chromatic aberrations.

Filter and Diffusion Discs

There are two more types of supplementary attachments we might briefly mention—filters and diffusion discs. The color characteristics of the common filters have been discussed previously herein, and complete data is available elsewhere, so beyond mention of the fact that the filters of glass or cemented gelatin can introduce aberrations, if the filter is of poor quality, we shall go no further.

Diffusion discs accomplish what the older photographers did with the soft focus lenses—the introduction of extraneous light into the image, softening detail. This is accomplished in the diffusion discs by means of lines and/or cir-

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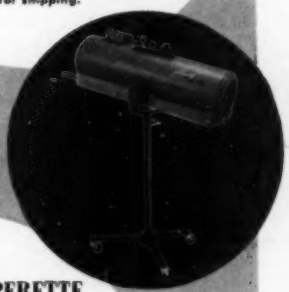

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cles in intaglio or relief ground and/or polished into the surface of a glass disc. These ridges or valleys act as sections of lenses, and scatter the light which would normally reach the image, spreading it over the whole of the image plane. Naturally, the exposure must be increased when one of these attachments is used.

The Enlarger

The enlarger is one of the most important and interesting pieces of photographic equipment. Essentially it is a camera with an illuminated negative. The most interesting aspect of the enlarger is its illumination, which may be of two fundamental types, *diffuse* or *condenser*. These two types differ basically in their action.

Diffuse illumination, achieved by inserting a ground or opal glass between the negative and the illuminating lamp, of necessity provides the softest illumination of the negative, and thus, directly, the least harshness upon projection.

To see this, consider a typical negative with a wide range of tones. The opal glass diffuses the light thoroughly, that is, the emergent light is scattered in all possible directions. But the lens can pick up only that light which is directed toward it. Each element of the negative will be sending light to fill the aperture of the lens, and the shadows cast on the lens by the dark negative areas will be receiving light from the adjacent lighter areas.

Expressed in different words, in diffuse illumination the negative shadow areas are weakened, meaning that the contrast is lowered. This then necessitates either using a contrastier grade of paper, or making more contrasty negatives.

Condenser Illumination Action

The situation is quite otherwise with condenser illumination, for there, under the best operating conditions, the dense areas are not diluted by scattered light and the full contrast of the negative is effective. However, the conditions to be observed in condenser illumination appear to be unfamiliar.

It would be taken as a *cliche* if we were to be reminded that a lens is most efficient in yielding bright images when it was filled with light, yet that is the condition too often forgotten in enlarging or projection. To achieve that state, it is necessary only to image the light source at the diaphragm of the enlarging lens, and to use condensers whose effective F-number is equal to that of the lens. If the condenser F-number is less than that of the enlarging lens, the latter has been optically stopped to the condenser number.

When the enlarging lens has been filled with light at its full opening, it will remain so at other stops. But maintaining this condition of imaging the light source in the diaphragm plane necessitates focusing the light source for each change of magnification, since then the condenser lens distance changes. This, together with the accuracy necessary in alignment of condenser systems, has resulted in their being less popular than the diffusion systems, in spite of the tremendous advantages enjoyed by condensers in illumination. It is easy to see that the illumination in a diffuse enlarger is very much less.

Enlarging Lenses

A word about enlarging lenses. It was not specifically pointed out in the discussion of the lens aberrations that the aberrations can be corrected for but one object position; (for many practical purposes however, they depart little from this ideal correction for relatively large changes of object positions). This unfortunate fact hampers the designer in his work, for he then must make a lens for one specific job, and when radically different conditions are imposed, he must design another lens.

Enlarger lenses have been so corrected that they will work best at short conjugates, and will give inferior images in general for an infinite object. Camera lenses, on the other hand, have been designed to give their best images of an infinite to distant (down to perhaps 10 times focal length) object, and cannot be expected to do a top-notch job in an enlarger.

The common impression that for best results *enlarge* with the taking lens is mistaken. Of course, if the photography is first rate, and if the lens is stopped down, a camera lens may give satisfactory enlargement, but then better quality would certainly have been achieved with a lens specifically designed for the enlarging job.

[THE END]

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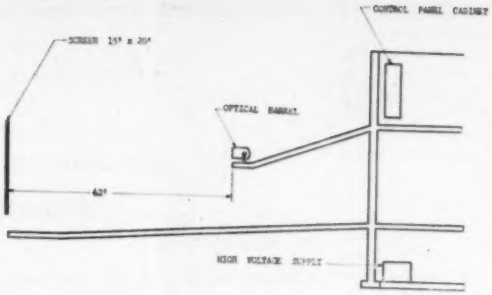


FIGURE 1
Showing the usual locations of the GPL theater Tv units. Modification of these locations is not only possible but sometimes necessitated by structural requirements.

Direct-Projection Theatre Tv System

By FRANK N. GILLETTE

General Precision Laboratory, Pleasantville, N. Y.

The data given in this article are based on a series of oral-demonstration presentations given by GPL engineers in various sections of the United States, and notably on that presented before 400 projectionists at the November meeting of the 25-30 Club of Greater New York.

SIMPLICITY in installation, convenience in maintenance, and reliability in operation were the goals in the development of the Simplex direct-projection Tv system (Model PB-600) manufactured by General Precision Laboratory. Included is every facility required for operation from every standard source of Tv signal and for presenting on the theatre screen a full-size Tv picture of the highest quality.

Three units comprise the equipment; an optical barrel, a control panel, and a high-voltage supply; their installation location is shown in Fig. 1.

Equipment's Three Units

The high-voltage supply can be installed in any convenient location. It has no controls, meters, or switches mounted on it and should require no attention for months at a time.

The control panel contains all operating and the great majority of alignment and service controls. This unit would normally be installed in the projection room, many alternative locations are possible.

The optical barrel installation, however, is governed by the fact that the projection optics have a fixed focal length and an extremely wide aperture, the location for the barrel is restricted to rather narrow limits by the size and location of the projection screen. The screen should be selected for the best reflection incident light into the audience area. Beaded screens are acceptable only in narrow theatres; in wider theatres they give poor performance because of the large reflection angles.

15 x 20-Foot Screen Image

The optical system provides a picture 15 feet high and 20 feet wide at a throw distance of 62 feet. The system does permit some variation of picture size and throw, but there are also some unyielding restrictions on such variation. Specific attention is directed to the nature and source of these limitations.

Figure 2 shows the optical elements. The picture is formed on the face of the cathode ray tube at "T". Light from the tube face is collected by the mirror at "M" and directed toward the projection screen at "S". The corrector plate is inserted at "P" so as to correct for aberrations, principally spherical aberration, of the mirror.

The design of the entire optical system is fundamentally controlled by the cathode ray tube, in this case a type 7NP4. For good focus over the entire picture area it is necessary that the curve of the mirror be essentially concentric with the curve of the tube face. It is further necessary that the tube face be located approximately at the focal point of the mirror.

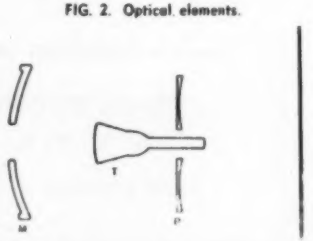
Since the focal length of a spherical mirror is equal to one half its radius of curvature, the foregoing conditions result in a mirror having a radius of curvature twice that of the cathode ray tube and a system having a focal length equal to the radius of curvature of the tube face.

10% Permissible Image Change

With the focal length fixed in this way, there is a single value of magnification for any chosen throw distance. Thus picture size at a fixed throw distance can be changed only by changing the size of the picture on the cathode ray tube. If the size be increased too much, the corners will be clipped by the edge of the tube. If the size be decreased appreciably, resolution will suffer. In practice, the dimensions of the picture can be varied some 10% either way from the nominal size.

The magnification is, of course, a linear function of the throw distance; but throw distance is not readily controlled, being strongly influenced by theatre design, and can be manipulated only by reconstruction of a more or less extensive nature. If the preferred installation location provides a throw that is too short, use of a smaller screen is possible and provides the attendant advantage of increased screen brightness. If the preferred location gives a throw

FIG. 2. Optical elements.



that is too long, the only answer is theatre modification. Increasing the screen size won't do, because the brightness soon becomes unacceptably low.

Theatre people are familiar with these relationships, but unfortunately they are also accustomed to purchasing projection lenses in many different focal lengths so as to satisfy almost any requirement. Naturally, they expect similar flexibility in theatre Tv equipment.

Factors Controlling Flexibility

The cost of designing and stocking expensive optical systems of different focal lengths is one obvious reason for not offering such flexibility. Other and more forceful reasons are indicated in Fig. 3.

Here the central figure shows the components of our present optical system. The upper diagram shows a system of shorter focal length, and the lower a system of longer focal length. As drawn, the three systems have equal geometrical apertures and so will provide approximately the same screen brightness.

It will be noted that the diameters of the optical elements of the system of longer focal length are considerably larger than the elements of the Simplex system. Not only are such elements much more expensive than those used in the present system, they are also larger than can be manufactured in quantity by existing equipment.

The system of shorter focal length involves smaller components which could indeed be manufactured at reasonable cost. However, the angular width of the picture becomes significantly greater. As this angular width becomes larger, the optical design problem becomes tremendously more complex. Adequate correction of optical aberrations in the corners of the picture becomes virtually impossible.

Variation of Schmidt System

Although an optical system of this type is generally called a Schmidt system, it differs tremendously from the system originally developed by Schmidt for use as an astronomical telescope. Fundamentally a Schmidt system consists of a spherical mirror, a diaphragm located at the center of curvature of the mirror, and a corrector plate also located at the center of curvature. The diaphragm serves to eliminate third-order aberrations, and the corrector plate provides compensation for spherical aberration.

The optical quality of this system can indeed be very good, provided the design is restricted to an angular field of something like 1 degree and an aperture less than F:3. For the Simplex system we require an angular field of 23 degrees and a geometrical aperture of F:7. Clearly, these requirements are well beyond the limitations of the basic Schmidt design.

The classical Schmidt formulae have been applied to the present conditions with a reasonable degree of success. However, much better results have been obtained by approaching the design problem from a somewhat different point of view. Mr. Louis Raitiere of our staff developed a design approach which results in a system that differs slightly but very significantly from the Schmidt system. The performance thus obtained has been gratifying. We observe a limiting resolution in the extreme corner of the field of 2000 Tv lines per picture height. This figure, of course, applies to the optical system alone and not to the overall system.

NOTE 1. That is, this would have been true had Fig. 3 been drawn correctly. The three tube diameters should be equal rather than proportional to focal length as shown in Fig. 3.

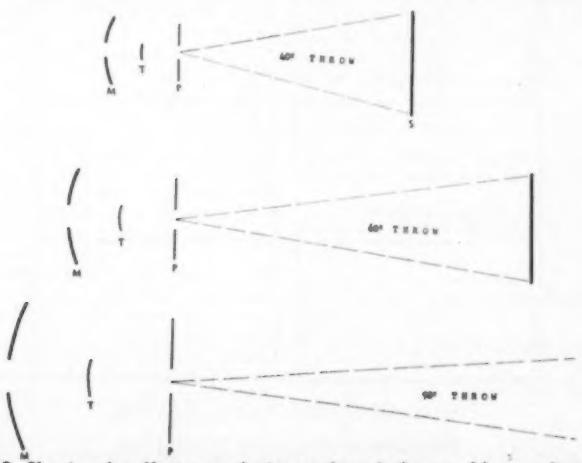


FIG. 3. Showing the effect upon the image through the use of lenses of various focal lengths.

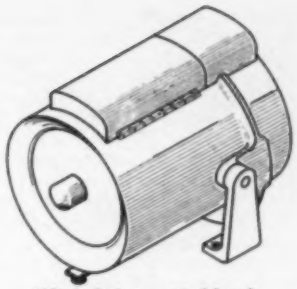


FIG. 4. Projector optical barrel.

Completely Enclosed Optical Barrel

The detail contrast ratio that is obtainable in any system which works with a cathode ray tube as the basic picture source is never as much as one would desire. The contrast ratio is still further degraded by the presence of any dirt on the optical elements of the system.

To reduce the rate at which dirt collects on the optical elements, and consequently to minimize the necessity for frequent cleaning, the optical barrel shown in Fig. 4 is completely enclosed and there is no circulation of outside air through the system. The cooling air which must be directed against the face of the cathode ray tube to avoid damage to the tube is recirculated through the barrel and serves only to conduct heat from the cathode ray tube to the outer walls of the barrel. The outside of the barrel provides such a large radiating surface that the resulting temperature rise is insignificant.

The use of a closed system also permits quite simple solutions to any problems arising from excessive humidity. We have thus far had no difficulty with arc-over within the barrel; but should such difficulty develop, we anticipate no trouble in controlling the humidity within the unit.

The barrel is supported mechanically at three points. The two pivot points are located at approximately the center of gravity and carry the bulk of the weight of the unit. The third support point is at the bottom of the front of the barrel. Its function is to tilt the barrel and to hold the line of sight once it is established. The maximum tilt that is permissible from optical considerations is approximately 7 degrees. If it is possible to tilt the screen, a greater tilt of the barrel can be accommodated by the mechanical adjustment provided.

The barrel opens at the top for clean-

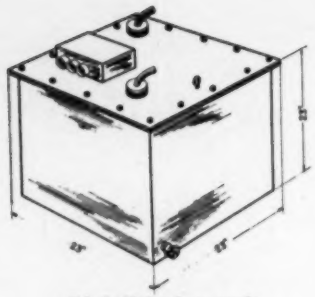


FIG. 5. High-voltage supply.

ing and service. The video amplifier and the alignment controls are located here, which makes readjustment or tube replacement very simple. Of course, there are no more tubes in the barrel than is absolutely necessary. Only the final video amplifier is located here.

Cathode Ray Tube

The cathode ray tube is mounted in the deflection yoke which is in turn held by a support arm that hangs from the top of the barrel. The support arm fastens to a mounting plate from which it can easily be removed and to which it returns without disturbance of previously made alignment adjustments.

All alignment adjustments required by tolerances of the cathode ray tube itself are made on the support arm assembly. Thus any projectionist can equip himself with a spare tube support arm in which he can mount and align a spare cathode ray tube to have it in instant readiness for replacement. To facilitate this operation, all electrical connections to the cathode ray tube and the deflection yoke are carried up the tube support arm to connectors that can be quickly disconnected in time of need. Thus a show need not be lost for more than three minutes by failure of the cathode ray tube.

The 80 Kv power supply is shown in Fig. 5. This unit provides the anode voltage for the cathode ray tube and also the focus voltage.

Power Supply Circuit

The circuit is a 60 voltage doubler using two type VR3B rectifiers. The output voltage is regulated against variation in both line voltage and load current by an electronic regulator, which controls a saturable reactor in series with the primary of the high-voltage transformer. The regulation characteristic is essentially flat from zero current to 2.5 milliamperes. Beyond 2.5 milliamperes the voltage drops rapidly with increasing current in the manner required for protection of equipment against permanent damage in case of momentary failure.

The focus voltage is bled down from the 80 Kv level to take advantage of the stability of that level and to provide a focus voltage that will remain proportional to the anode voltage should any variation in that level occur. Remote control of the focus voltage is provided by a high-voltage triode used as a shunt across the low end of the focus bleeder.

Control Panel Cabinet

The unit is oil-filled for maximum reliability. It also contains a number of electrostatic shields and protective spark gaps on the low-voltage wiring to insure that any breakdown which might occur inside the unit will have no harmful effect on external circuits.

The projection room equipment consists of the Control Panel Cabinet (Fig. 6). It is a double-relay rack, each rack being of the standard width to accommodate 10-inch panels.

The rack itself possesses a number of special features that deserve mention. The component chassis are strictly conventional, each one consisting of a horizontal chassis with a vertical front panel of standard 19-inch width. However, the method of mounting is such as to provide much greater serviceability than is usually found in equipment constructed in this fashion. Each individual chassis is held in place with two quarter-turn locks. When these are released, the chassis may be drawn forward on rollers until it is fully clear of the rack. This provides quick access to all of the

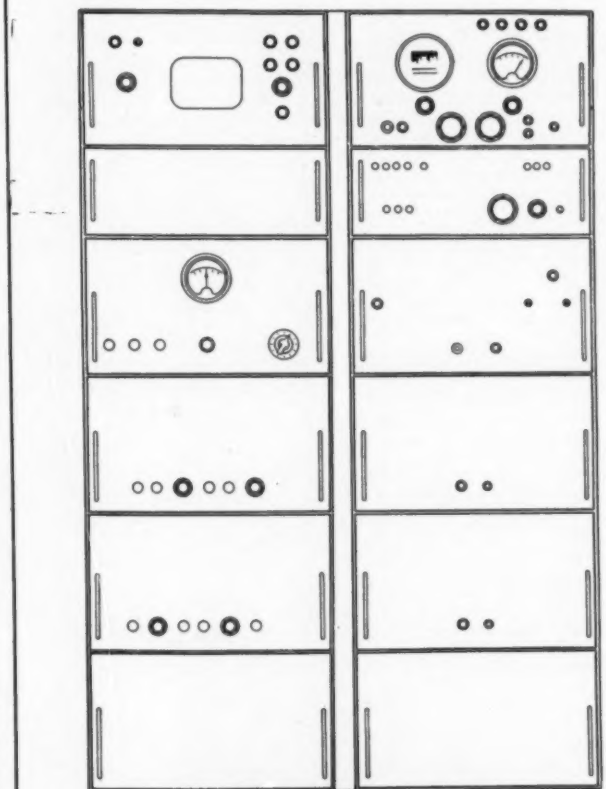


FIG. 6. CONTROL PANEL CABINET

Dimensions of this cabinet, in inches, are 63¾ high, 42¾ wide, and 18½ deep.

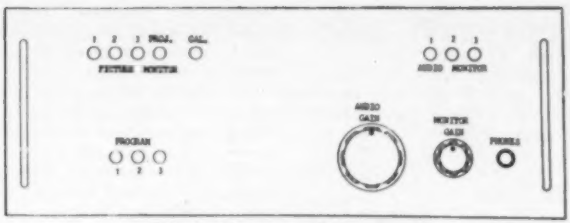


FIG. 7. Program selector panel.

tubes in the rack without the removal of cover plates or other ornamentation.

Should the wiring side of the chassis require attention, it is only necessary to lift the front of the chassis and swing it upward through 90° where it will rest in a stable position with the wiring facing outward. In either of these positions the chasis are still connected and still operating.

These provisions make it possible to perform all service functions without access to the rear of the rack. This same thought has been carried further. When all the chassis are removed from the rack, there remains but an empty shell. As a first step in installation, this shell can be bolted down, once and for all, in its final position, even though this places the back of the cabinet solidly against a wall. The conduits and cables can then be affixed and the chassis installed without further movement of the cabinet.

Control Unit Placement

The equipment in the racks is so distributed as to place the monitors and meters at eye level, and the operational controls at convenient finger tip level.

The unit in the upper left corner is the Picture Monitor containing its own power supply. The controls on this unit serve only to adjust the picture on the 8½-inch monitor tube.

Below the monitor is a receiver of rather superior characteristics provided for off-the-air reception during periods of test and alignment. (In Fig. 6 a blank panel is shown between monitor and receiver. In the production equipment this blank panel has been moved down to the bottom position to place the receiver at a better level for observation of the tuning meter).

The two units below the receiver are the vertical and horizontal deflection chassis. These units contain all of the deflection controls, circuits, and components except the deflection yoke, which is necessarily located with the projection tube in the optical barrel. The deflection circuits and components are especially designed to permit a long cable to the deflection yoke. With the cable usually provided, this run can be 150 feet. With special low-capacity cable even longer runs are possible. This point is mentioned particularly because this cable run is the only one in the system that bars any restriction as to length.

Below the deflection chassis are two blank panels (although Fig. 6 shows but one) behind which is located a line-voltage regulator that stabilizes the input voltage to various circuits that are not sufficiently critical to demand electronic regulation and to the filament transformers of more critical circuits.

In the right-hand rack the bottom panel is also blank. In this space is mounted the saturable reactor which regulates the 80 Kv supply.

The two chassis next above contain power supplies which provide the various plate and bias voltages required by all of the circuits except the monitors.

Above the power supplies is located the Hi-Voltage Control Unit, which contains all of the low-voltage elements associated with supply except the saturable reactor mentioned previously. The panel controls consist of push-buttons for controlling power to the supply and a knob for setting focus voltage level.

The remaining two panels in this rack are shown in more detail in the following illustrations. Fig. 7 shows the program selector panel located immediately above the high-voltage control unit. All signal switching and audio control functions of the equipment are performed on this panel.

Three Incoming Channels

The system provides for three incoming program channels, each consisting of an audio and a video line. Normally one of these channels will be connected to the receiver included in the equipment. The second will take the incoming program line. The third might be used for a parallel safety channel for the main program line, for an auxiliary microwave receiver, or possibly for a local signal generated by pick-up equipment within the theatre.

The switching facilities permit independent monitoring of any incoming audio or video line. The three push-buttons at the upper right connect any of the three audio lines to the monitor headphone jack in the lower right corner of the panel. The gain control for the monitor channel is adjacent to the phone jack. The larger knob sets the gain in the program line to the theatre. This control is used only to set the audio level from the television equipment to the level required by the input of the theatre sound system. It is not considered an operational control.

The push-buttons at the upper left switch the input signal to the Picture Monitor and also to the Waveform Monitor yet to be described. The first three buttons select any of the three incoming video lines. The fourth button, labeled "Projector," will be described in connection with Fig. 8. The fifth button is non-locking and serves to connect a calibrating signal to the Waveform Monitor for use in setting signal levels.

Program switching is done by the push-buttons at the lower left of the panel. They feed any of the three input channels to the theatre system, controlling both picture and sound. Interlocked switching has been used here as another means of eliminating operating error.

Figure 8 shows the Projector Control Panel which is located at the top of the right-hand rack. On this panel are concentrated all but one of the operational switches and controls normally used in turning on and adjusting the picture on the theatre screen. This panel also contains the waveform monitor and a multipurpose meter, both very useful as moni-

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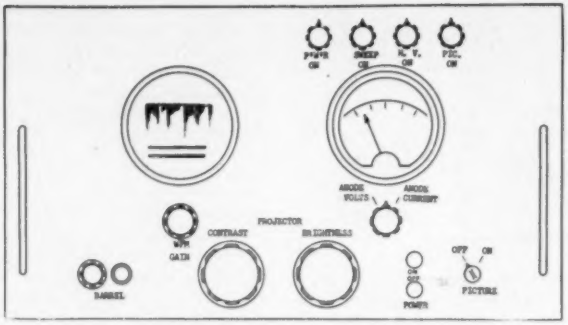

FIG. 8. Projector control panel.

tors during projection and as test instruments during preliminary set-up.

Four-Step Turn-On Procedure

The equipment will normally be turned on by the four-step procedure now to be outlined. Enough interlocks and protective circuits insure that no damage will result in the event of possible occasional operating lapses in turn-on procedure.

The progress of the operation is indicated by the set of four amber lights at the upper right of the Control Panel. Not until all four are illuminated will a picture appear on the projection screen.

As the first step, the main power relay is closed by means of the motor-starting type push-button located below the meter. This lights the first of the amber lights at once.

As the circuits warm up and reach normal operating conditions, the second amber light glows to indicate the presence of deflection fields at the cathode ray tube.

In the second step, power is applied to the Hi-Voltage Supply by means of the push-buttons located on its control panel. In a short time the anode potential rises to its proper level, causing the third amber light to glow.

At this point the entire system is turned on and the three lights inform the projectionist that all interlocks are closed, all supply voltages are present, and most of the circuits are functioning in essentially normal fashion. However, there is still no picture on the projection screen because the projection tube is biased well beyond cut-off.

Meter, Monitor Checking

The third step might be considered optional but is actually essential to good showmanship. It consists of using meter and monitors to preset various controls to insure that the picture first seen by the audience is a good image.

The test meter is used first to check the levels of the various supply voltages, including the 80 Kv anode supply. It is then used to set the operating bias of the projection tube at the proper level by means of the "Brightness" Control. Finally it is turned to the "Anode Current" position to serve as a monitor during the projection period.

The monitors, both picture and sound, are used first to check on the quality and the levels of the incoming signals. Then the picture and waveform monitors are switched to their "Projector" position. In this condition both receive a video signal brought back from the final video stage in the optical barrel, which permits preliminary adjustment, by means of the "Contrast" control, of the actual driving signal applied to the cathode of the cathode ray tube.

Furthermore, when the Picture Monitor is switched to the "Projector" position, its horizontal and vertical sweeps are synchronized directly by pulses obtained from pick-up coils wound into the deflection yoke of the projection cathode ray tube. Since these pulses are actually a measure of the magnetic deflection fields applied to the projection tube, a normal picture on the Picture Monitor is a *positive* indication that the deflection signals applied to the projection tube have the correct frequencies and essentially the correct amplitude.

Fourth and Final Step

All is now ready for the fourth step. Turning the "Picture" switch to "on" lights the fourth amber light, switches the projection tube from cut-off to operating bias, and presents the picture in essentially perfect adjustment.

The cathode ray tube used in this system is rather expensive, and while it is an amazingly tough device when treated properly, it is highly fragile when mistreated. These remarks apply equally well to personnel who operate and maintain the equipment. Consequently, the equipment includes an elaborate system of interlocks and safety devices for protection of both tubes and personnel.

The interlock system prevents the application of primary power to the high-voltage supply unless all doors giving access to the anode and focus voltages are closed. The protection system allows beam energy to reach the tube face only when the following conditions are satisfied:

Requisite Operating Conditions

1. Proper voltage levels exist in the + 800, + 285, — 105 and — 150 volt power supplies.

2. The 80 Kv supply is up to operating level, but not in excess of 82 Kv.

3. Horizontal deflection fields have at least 75% of their normal amplitude.

4. Vertical deflection fields have at least 75% of their normal amplitude.

The protection system is primarily designed to prevent damage to the 7NP4 projection tube, but it also serves to protect the remainder of the system against bias failure.

Throughout the system the protection circuits have been designed to work directly from the critical quantity and not from signals which usually, but not always, denote that quantity. For example, the circuit which protects against sweep failure might work with almost complete safety from various currents or voltages that are readily available in the deflection circuits. Actually, in this case, the critical quantity is the magnetic field in the gap of the deflection yoke. Our protection system includes pick-up coils in the yoke which measure the magnetic fields and thus give positive and complete protection against sweep failure.

In designing the Simplex system we have adopted the goal of providing quality of performance exceeding the requirements of present Tv standards, thus justifying the prediction that the equipment will not be found wanting whenever higher performance standards may be adopted.

[NOTE: GPL solicits through IP any questions relating to construction or operation anent the Simplex system stemming from the foregoing discussion. —ED.]

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Who Invented the Movies?

A stimulating discussion of the contributions of Friese-Greene, British technician, to the cinematographic art, as essayed by two able protagonists in *Films in Review*, official organ of the National Board of Review of Motion Pictures. Terry Ramsaye, author of the rebuttal, is a noted film historian and formerly editor of *Motion Picture Herald*.

By GERALD PRATLEY

IT WILL come as a surprise to many moviegoers to learn that William Friese-Greene was the first man to patent a commercially practicable moving picture camera.

While Thomas A. Edison is generally considered by America to be the *inventor of motion pictures*, and France claims Edouard Georges Marey as the *fondateur de cinema*, England considers William Friese-Greene as the *inventor of kinematography*.

The truth is that these three men, and several others in Europe and America, were all working on the then baffling task of trying to photograph and project moving pictures. But whereas Edison and Thomas Armat, Louis Lumiere and Georges Marey, all received wide recognition for their work, the unfortunate Friese-Greene has been ignored, not only abroad but also in his native land.

'The Magic Box' Film

A motion picture about Friese-Greene has just been made in England: *The Magic Box*, based on Ray Allister's fascinating biography, *Friese-Greene—Close Up of an Inventor*.

Friese-Greene was born on September 7, 1855 and died tragically on May 5, 1921. A prophetic and inventive genius, with a gay and vital personality, his life was one of tense struggle against a cunning opposition which sought to use his brains for personal gain. He attained unbelievable success, and experienced heart-breaking failure. During 30 years of hard work he patented over 100 inventions, and longed for the recognition which was denied him.

He died at a trade meeting which had been called to discuss a system known as block-booking. Heated discussion and wrangling were in progress, and Friese-Greene, old and tired, rose with a plea for unity. His voice was almost inaudible; and after he left the speaker's platform he collapsed and died.

Truth or Legend?

Huge, glittering cars rolled up to carry away the men who had grown wealthy on the genius of Friese-Greene. For him the police brought a hand-cart, and carried his body to the mortuary. In his pockets they found a formula for a color filter he had ordered that morning. And in his purse was all the money he possessed: one shilling and ten pence. At that time it was the price of a cinema seat.

In 1887 Friese-Greene stopped the traffic in Piccadilly by projecting his movie picture of a dancing skeleton onto a shop window. In 1889 he made some of the first films on celluloid, and experimented with synchronized sound. In 1893 he made a color film, and in the years which followed he experimented with chemicals, X-rays, lenses, the electrical transmission of images, stereoscopic films, and much else! The models of his inventions cost him a fortune.

Brilliant though he was, he had no mind for business and was continually bankrupt and poverty-stricken. He married twice, and brought up five sons. He could talk with, and feel at home among, the most brilliant scientists of his time. But he didn't know how to benefit commercially from his marvelous inventions.

British Film Industry All-Out

Friese-Greene's life contains all the ingredients that are essential for an engrossing, emotional film. And *The Magic Box* is additionally interesting because of the unique way in which it was produced. The entire British film industry co-operated in the most inspiring manner to make this film possible.

A non-profit making company (Festive Film Productions) was formed to produce and distribute this picture. The British Government advanced a loan for a script, and also money for production, with re-payment deferred until after

(*Continued on page* 38)

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Holiday Greetings LOCAL NO. 488 I. A. T. S. E. HARRISBURG PENNA.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

EACH YEAR at this time we are acutely conscious of (and embarrassed by) the desire to acknowledge in mere words our indebtedness to those IA men who by their constancy have made our otherwise feeble efforts an asset to craft progress and general welfare. True, sometimes we felt the urge to lash out at those and that which we felt visited an injustice upon the craft—and we were somewhat on the biting side; at other times we probably were more than lavish in our praise of those who, we felt, were deserving of not only our personal but also of craft commendation.

To those whom we have been privileged to serve in our meagre way by the few notes which were spread upon these pages over the past year, no less than to those whom we may have differed with, or maybe slighted in even the smallest measure, we say—

The Very Best of Everything Now and in the Years to Come

• Radio and television sound-effect technicians of the American Broadcasting Co. chose, *with only one dissenting vote*, the IA as their bargaining agent, replacing NABET, which had represented them until the expiration of their contract October 31 last. The NLRB, in granting the IA's petition for an election, rejected NABET's contention that the sound-effect technicians should be merged into an *existing* unit of engineers.

"The primary function of the sound-effect employes," the Board declared, "is to create sound, other than voice, speech, and music, which is necessary to achieve realism in the production of radio and television programs. They perform from prepared scripts in front of microphones, as do actors, singers and musicians. The sound-effects personnel constitute a division of the program department, which is concerned with the artistic quality of broadcasts. The engineering department . . . is responsible for the transmission of the artistic effects through the electronic process."

TIFFIN LOCAL 267 HONORS MEMBERS

Diamond-studded IA lapel pins were recently awarded to three members of Local 267, Tiffin, Ohio, for long and loyal service rendered the Local. Shown above (left to right) are the honored members: Henninger, O Connell, Banks, and at the extreme right is Robert E. Shuff, who made the presentations.

• Pierce Webster, charter member of Buffalo Local 233, won two grand prizes in the 1951 Newspaper National Snapshot contest, in addition to two special cash awards for the other entries. Webster has made amateur photography his hobby for the past few years, but this was the first time he entered a national contest.

• Three members of Local 505, Waltham, Mass.—Herman Lavoie, Norman Bliss, and Arthur Courtemanche—have been placed in the projection room of the drive-in theater opened recently in "Shoppers World," a new shopping center in Framingham, Mass.

• Hye Bossin, managing editor of *Canadian Film Weekly*, published recently the first edition of the Year Book, a comprehensive directory of information on every phase of the industry in Canada. This work reflects painstaking research on the part of Hye and his staff. Congratulations for a fine job.

• Stewart Seifert, Local 203, Easton, Penna., and secretary of the Central Labor Union of Northampton and Warren Counties (Penna.), has been appointed a member of the 14-men Labor group on the Labor Management Committee now being organized in Lehigh (Penna.) Valley. The committee will study, among other things, manpower problems arising from the defense program and recommendations for their solution.

Committeemen were recommended to this second body of its kind in Penna. by the National Labor-Management Policy Committee, with appointments made by U. S. Secretary of Labor Maurice J. Tobin upon the recommendations of D. M. Walker, secretary of the Penna. Dept. of Labor and Industry.

• We were very glad to see our old friend J. E. (Frenchy) Biencourt, Local 78, San Antonio, Texas, on his recent visit to New York. Frenchy and his wife were delighted with the mild N. Y. weather (68° at the time). Note to Frenchy: It's snowing at the moment these lines are written.

• At its regular December meeting, Local 366, Westchester County, N. Y., awarded 30-year membership pins to Charles Bantel, James Maloney, Edward Mascaro, Barney Ostroff, Frank Pilegard, Max Siegel and Joseph Schappach. Under the able leadership of Nat Storch, president, and Joe Monaco, business representative, Local 366 has cemented its reputation as a well-organized IA unit.

• Lou Walters, Local 249, Dallas, Texas, now heads the repair department for the Dallas branch of National Theater Supply Co. He has been associated with NTS for 20 years, 10 of which he managed the Cleveland branch. Lou is very popular with IA men everywhere; he holds a gold life membership card in St. Louis Local 143, and is active in the affairs of the Dallas Local.

• We were always a firm believer in the principle that family differences should

be settled within the family, preferably around the dinner table. Our belief in this principle was strengthened during the past month when we were able to serve, in a small way, a group of swell guys who through their friendship have eased our way through the years.

Our old and good friend, Oscar Neu, president of Neumade Products, was on the West Coast attending the TESMA-TEDA and the SMPTE conventions, when the AF of L Machinists' Union sought to enlist the aid of all IA Locals in support of a strike against the Neumade factory in Buffalo. Naturally, Oscar wasn't available to straighten out the misunderstanding.

A long-distance phone call from Bert Ryde, business representative for IA Local 233, Buffalo, set the conciliatory wheels in motion, with the result that Bert and two representatives of IA Stage Hands Local 10, Buffalo—Danny Gill and Charles (Red) Schaffer—and Floyd Smith, business representative for the Machinists Union (and, of course, yours truly) met with Oscar Neu in New York City. In a few hours a seemingly "impossible" situation was settled amicably.

Our AF of L fellows, Machinists and IA men, made a very fine showing during the conference—and we can say no less for Oscar Neu and Lee Jones of the Neumade Company, and for their attorney, John M. Keating.

• George Schaffer, business representative for Los Angeles Local 150, was successful in organizing two non-union theaters in L. A., and obtained contracts calling for substantial wage increases for the projectionists. Intensive picketing by the Local did the trick.

• John H. Wald, Sr., 52, business representative for the past 22 years of Local 434 Peoria, Ill., died recently after a short illness. He was prominent in Labor and civic circles throughout the State, and his sudden death saddened his many friends.

John served as secretary of the IA 9th District, and at the time of his death was president of the Peoria Trades and Labor Assembly. He was active in the management and financing of the AF of L Labor Temple in Peoria, and served as manager of the Temple and as secretary of the Temple Association for more than 15 years. In 1938 he established the *Labor Temple News*, official organ of the Peoria Trades and Labor Assembly, and served as its publisher until his resignation last January. He was a member of Temple Lodge 46, AF & AM, and of the Elks Club.

John is survived by his father, John H., of Calif.; a son, John H., Jr.; a daughter, Mrs. Ralph Powell, and five grandchildren.

The late John H. Wald

• New York Lodge No. 1, TMA, held its 87th annual celebration at the Carnival Room, Hotel Capitol, New York, November 17 last. As usual, the party was very well attended by many prominent figures in Labor circles, and, also as usual, it was a grand party—a tribute to Lodge No. 1.

• The 41st biennial convention of the IATSE will be held at the Auditorium, Minneapolis, Minn., the week beginning August 4 next, with official headquarters at the Nicollet Hotel. As usual, Executive Board meetings will be held the week prior to the opening of the convention.

• Congratulations to Local 210, Edmonton, Canada, on its 40th anniversary. The Local celebrated the event several weeks ago at a dinner party which was attended by the entire membership and a number of invited guests.

• This department would somehow seem incomplete at this Holiday season if it did not include a few words about that good and great friend of all of us who live with and by the process of projecting motion picture film—P. A. McGuire. The term "Better Projection Pays" was coined and broadcast throughout the world by Mac, but it still was just a phrase until he followed through and breathed life and vigor into it. Amityville, Long Island, N. Y., is where Mac resides these days, but this town is far too small to contain his spirit. He belongs to us because he gave us so much of himself. Doff your hats, fellows, to our friend—P. A. McGuire.

P. A. McGuire's "Better Projection Pays" Does Pay

A pioneer projection man merits a bow —and more— from the craft.

• During a short stay in Boston several months ago, we were told by Joe Nuzzolo and Walter Diehl, president and business representative, respectively, of Local 182, that they were approached by several exhibitors who suggested that if the Union would either reduce the manpower in their theaters or take a cut in pay, they would reopen their shuttered houses. The reply of Nuzzolo and Diehl was a flat "No soap," based on the fact that

—1951—

Greetings From

MOTION PICTURE PROJECTIONISTS
LOCAL UNION NO. 233
Buffalo, N. Y.

JOHN J. WALSH
President

ALBERT F. RYDE
Business Representative

★

Greetings to the Craft

CENTURY PROJECTOR CORPORATION

LARRY DAVEE, *Sales Manager*

NEW YORK, N. Y.

since members of Local 182 did not benefit from the lush theater profits during the past years, they do not feel obligated to take a cut when box-office receipts take a drop.

Although these exhibitors protested their inability to reopen their theaters unless concessions were made by the Local, their cry of "Wolf" fell on deaf ears, and when the theaters *REOPENED* shortly afterwards, it was with the same manpower and pay as formerly.

• Paul L. Ferry, 47, former president of Pittsburgh Local 171, succumbed to a heart attack last month. Paul took an active part in Local 171 affairs, serving on various committees, and for many years was a delegate to IA conventions.

• Local 163, Louisville, Ky., lost three games in the recent AF of L Bowling League contest with Carpenters Local 64. C. Baker, with 500, was high for the winning team, and J. Flaherty, Local 163 business representative, was high for the losing team with 486. Better luck next time.

• Edwin W. Anthony, president for the past 23 years of Local 223, Providence, R. I., died of a lingering illness at the Rhode Island Hospital on Friday, November 23. Edwin served Local 223 continuously since 1928; prior to that he was secretary. He was highly regarded by all who knew him for his many fine qualities.

• When the Aster Theater in Minneapolis, Minn., changed ownership, the new management asked projectionists' Local 219 for a cut in manpower—from a two-man to a one-man shift. A contract with the former owner of the theater, the Minnesota Amusement Co., calling for two-men shifts, plus one relief man, was still in effect when the concession by the new management was asked. Failing to receive the cut they demanded, the new owners closed the theater. The officials of Local 219 are to be congratulated for their determined stand, as it is a well established fact that once such concessions are granted they set a precedent for further cuts.

• Congratulations to the officials of Local 224, Washington, D. C. on their victory over Washington exhibitors who sought to eliminate the two-man projection room regulation. The appeal of the exhibitors to the D. C. Board of Commissioners to drop this regulation was based on the widespread use of acetate film. This decision makes sense to anybody who knows anything about the motion picture business, because nitrate film will be in circulation in one way or another for many years to come—a fact which is readily admitted by the manufacturers of film stock.

True, the manufacture of nitrate stock has been discontinued, but there is plenty of it in the laboratories which will be in use for years to come. Also, there are thousands of reissues that are released from time to time, and until such time as these are taken out of circulation or are replaced by prints on acetate stock, the fire hazard in theater projection rooms will never be eliminated.

Ruling of the Commissioners in favor of Local 224 that the two-man regulation be continued, sets an important precedent and will, no doubt, affect the plans of many exhibitors throughout the country who were contemplating similar moves.

• Walter F. Diehl, business representative for Boston Local 182, was appointed by John J. Delmonte, Mass. Commissioner of Labor, to serve on the minimum wage board as employes' representative.

• We were very much interested in a trade press report that United Paramount Theaters had entered into negotiations with the Theater Guild to present a large-screen telecast of the Broadway show, "St. Joan," by George Bernard Shaw, not only in Paramount Theaters but also in other non-competitive theaters that are equipped for large-screen Tv.

Season's Greetings

CLAYTON PRODUCTS CO.

3145 TIBBETT AVENUE

NEW YORK 63, N. Y.

Greetings from

LOCAL NO. 257

I. A. T. S. E.

Ottawa, Ont. Canada

Holiday Greetings

PROJECTIONISTS

LOCAL NO. 376

Syracuse, N. Y.

Season's Greetings

PROJECTIONISTS LOCAL NO. 173

I. A. T. S. E.

★

TORONTO, ONT. CANADA

Eidophor Theater-Tv System

In Which Some Pertinent Questions Are Posed

GLOWING reports bearing on the high degree of efficiency *and* operating practicability of the Swiss-developed Eidophor theater-Tv system continue to flow from Zurich in the form of "rave" comments by officials of 20th Century-Fox, which has extensive world distribution rights for the system, and other technical personnel who have witnessed Eidophor demonstrations.

Technical personnel of both General Electric Co. and Columbia Broadcasting System have been extremely enthusiastic about the Eidophor system, which attitude is understandable in view of General Electric's deal to manufacture Eidophor equipments here in the United States, and, on the part of CBS, because of 20th Century-Fox's plan to use the CBS mechanical color Tv unit.

Technical data anent the Eidophor system has been hidden under a blanket of secrecy to date; but IP is privileged to present, as a publishing "first," the appended information which is the result of painstaking investigation.

How the Eidophor Works

The Eidophor theater Tv process is understood to work in the following way:

1. An electron beam, much like that in an ordinary Tv picture tube, falls on a thin flat layer of a tacky or viscous fluid.

2. The fluid forms a thin layer which has been spread on a flat circular glass sheet.

3. The glass sheet is rotated around its center under the electron beam, by means of a special motor. Thus the beam constantly strikes new parts of the fluid.

4. Where the electron beam hits the fluid layer, the fluid is heated, expands, and forms slightly raised points or ridges. These ridges thus produce a "picture" in the fluid, in low relief (that is, with small peaks and valleys).

5. As the glass disc rotates, after each "picture" in the fluid has been projected, rollers smooth the fluid layer.

Refrigerating Unit; Illumination

6. The fluid on the glass plate may also be cooled by a refrigerating system connected to the outside of the Eidophor tube.

7. All of the parts aforementioned (except the refrigerating equipment) are within a vacuum tube, and hence are kept at very low pressure.

8. A powerful arc is provided as a light source. Its light passes through a novel and unusual lens system, and special grids, producing what is known as the "schlieren" effect. By means of this effect the light passing through the fluid "picture" is modulated or controlled, and an enlarged picture is thrown on the theater screen.

CBS-Eidophor Color System

The *CBS*-Eidophor *color* process is understood to work as follows:

9. When thus used, with the CBS field-sequential method of color Tv, the Eidophor presumably employs moving color filters which are placed in the arc light beam and driven by means of a synchronous motor.

10. The CBS-Eidophor color system accordingly resembles in a general way the CBS color-Tv system for the home.

Pertinent Technical Questions

The following questions, *in relation to the above numbered sections*, will naturally occur to the projectionist, the serviceman, and other technicians:

1, 2, 3, 4 above. How easily is an Eidophor picture tube installed, adjusted, and kept in operation? Can the fluid on the rotating glass disc be depended on to stand up under steady and heavy duty? Is adjustment of the "picture" formed in the fluid by the electron beam thoroughly stable, or is it critical and variable?

5. above. Is the smoothing of the fluid layer a simple and dependable matter? How long is the fluid usable under load?

6, 7 above. How much of a job is the maintenance of the refrigerating system? How long must the refrigerating system be running before the Eidophor tube can be used? Must the refrigerating system be adjusted to take care of average picture brightness, total projection time, or room temperature?

Operating at this low pressure, will the oil vaporize and very quickly contaminate the electron gun by reason of condensation?

Optical System Complexities

8. above. Is the optical system of the Eidophor projector more complex than that in a standard theater film projector? Is it more complex than that in the usual Schmidt theater-Tv projector? Could a projectionist be expected to have the time and skill to keep it clean and in perfect adjustment? In the sooty air of the average city, and in the usual projection room, how often must the optical system be cleaned and adjusted?

5, 6, 7, 8 above. If anything goes wrong in the Eidophor tube itself, or in its accompanying gear and optical system, how long would it take a projectionist, or a serviceman, to fix it? Must Eidophor equipment be available in duplicate for dependable theater operation?

Requisites for Color Pictures

9. above. During the recent color-Tv arguments before the FCC, it was claimed that the CBS color system produced only 40% as much fine detail as

Compliments of the Season

PROJECTIONISTS LOCAL NO. 199

DETROIT MICHIGAN

Best Wishes for 1952

Holiday Greetings

LOCAL NO. 314

I. A. T. S. E.

SCHENECTADY, N. Y.

Holiday Greetings from the

OFFICERS and MEMBERS

of

LOCAL NO. 396

Binghamton, N. Y.

Season's Greetings
from
LOCAL NO. 273
I. A. T. S. E.
New Haven Conn.

Holiday Greetings
LOCAL NO. 762
I. A. T. S. E.
San Luis Obispo Calif.

that available from the opposing simultaneous system. Will this also apply to the CBS-Eidophor theater color-Tv system? And, if so, will not CBS-Eidophor color-Tv networks have to provide a wider frequency band and therefore more costly circuits (which might not be obtainable.

9. above. It also was claimed in the FCC hearings that the CBS system showed flicker, color break-up, and colored action fringes. This was stated to be particularly so unless dim pictures were accepted. Will these effects cause eyestrain, disagreeable color flashes, and colored edges on rapidly-moving objects in the CBS-Eidophor system?

1-9 above. How will the first cost of the Eidophor equipment, compare with that of the competitive RCA, Paramount, General Precision Labs and other systems? And how will the maintenance cost of these systems compare?

It may be assumed that the foregoing and other technical questions will be answered before the Eidophor system is offered for general distribution; they are posed here in the interest of maintaining a balance between unsupported general statements and fact.

Westrex Disc Recorders for 'Voice'

The International Broadcasting Division of the U. S. State Department has comp'eted negotiations with Westrex Corp. to acquire 22 W. E. Type RA-1389 disk recording machines, for use by the "Voice of America" to cut master records from which a number of transcriptions will be made. These transcriptions will be broadcast by transmitters operated by the "Voice" both here and abroad. The recording machines are equipped as complete units with synchronous motors and 33 1/3-78 r.p.m. recorder-holder, 2A lateral recorders, lateral recording equalizers, 5-B amplifiers, and the Davis drive flutter-suppressor.

'Depth of Focus'—Again

Recent reports from Hollywood anent "new" processes and procedures which are warranted to achieve startling photographic effects at no extra cost include, among other aberrations relating to three-dimensional movies and such, that old chestnut anent so-called depth of focus. Such effusions relating to getting something from that which isn't and never was prompt the publication here of a truism which is not subject to change on the basis of mere whim.

Changing the focus of a lens during the exposure is an old procedure. It is worth considering just what happens when the lens focus is shifted, during the exposure, from foreground to background.

When the lens is focused on the foreground, it is self-evident that the foreground is in sharp focus. If the background lies outside of the usual depth of the lens at the stop which is used, it is equally evident that it will be out of focus. The film, which has no particular discrimination or selection ability in itself, will accordingly photograph—or start to photograph—a sharp foreground and a blurred background.

If the lens is now shifted so that the focused zone moves toward the background, the image of the foreground will get progressively softer and more fuzzy, and the image of the background will become increasingly sharper. When the lens is finally focused on the background at the end of the exposure, in this simple case, the background will be in sharp focus but the foreground will be badly blurred.

Picture is Nowhere Sharp

The photographed picture at each distance from the lens will therefore include, first, one sharp but brief component and an infinite number of increasingly soft and, finally, very fuzzy components. This will hold for *all* distances from the lens. So that the picture will be nowhere sharp.

It is easy enough to increase depth of a lens by spoiling picture quality. But the projected pictures are enlarged hundreds of times on the screen in the theater, and the best lens quality is just good enough for clear and sharp reproduction. Except where soft and foggy effects are deliberately desired in special cases, enlarging very soft film is the wrong way to produce good pictures in the theater.

There is no question that increased depth is highly desirable in motion pictures. But the way to get it is not to start by throwing out the most important characteristic of good pictures, namely, their sharp and clear quality.

Supersonics to the Nth Degree

Supersonic free-air telemetered tests are now carried on at Edwards Air Force Base in Muroc Dry Lake, Calif., where a rocket-propelled sled carries an entire airplane model or component parts faster than sound along a precision track. Radio instruments feed all sorts of data to computers and recorders. Later these data are analyzed for clues to better and faster aircraft.

The free-air track is superior to a wind-tunnel for supersonic research because in free-air there are no confining walls to reflect the shock-wave back to the airplane and so confuse results. Stopping the rocket at the end of the track becomes quite a problem when the rocket travels at speeds equal to a rifle bullet. Engineers constructed a water trough 2000 feet long. A scoop built into the bottom of the test sled dips up water from the trough and gradually slows it to a stop.

What do Researchers Do?

Research labs in the general field devote 10 to 20% of their work to fundamental studies, 40 to 60% to development of new products and processes, 30 to 40% to improvement of existing products and processes, reports J. A. Leermakers, Eastman Kodak Co. Keeping laboratory and company people informed of progress requires continuous informal discussion, making written reports available, and holding two kinds of conferences: (1) Discussions of development work, attended by research, manufacturing, and sometimes sales departments. (2) Meetings of laboratory members to report progress to their fellows.

Best Wishes from
MOVING PICTURE PROJECTIONISTS
LOCAL UNION NO. 181
BALTIMORE, MD.

Holiday Greetings
LOCAL NO. 10
I. A. T. S. E.
Buffalo, N. Y.

Best Wishes
MOVING PICTURE MACHINE
OPERATORS' LOCAL NO. 182
Boston, Mass.

'Fuzzy Frames' in Color Prints

In a letter to Editor R. H. Cricks of the *Ideal Kinema* (London, England), a British projectionist poses a very interesting question anent Technicolor prints. The letter follows:

"A few words as to how Technicolor prints acquire their "fuzzy frames." The enclosed cutting was taken from a . . . trailer which had been stored in a damp box outside. It was damaged by actual drips of water, and the effect in running was that the . . . picture appeared to go out of focus for a brief period every 2 feet or so.

"I suggest that the three layers expand in dampness and shrink in varying degrees on drying out, causing the three images to become mismatched. If the cuttings which you receive from time to time compare with the enclosed, then there can be no doubt as to the cause."

Bearing on this question is the appended commentary by the author of the recently concluded series of articles on color motion pictures which appeared in these columns.*

By ROBERT A. MITCHELL

NOT mentioned in my articles on color was the mythical phenomenon of moisture causing the "three layers" of emulsion in Technicolor prints expanding in various degrees, thus presumably resulting in mismatch of the Yellow, Cyan, and Magenta images.

This British fellow's trouble is not what he thinks it is. He either has a print which came from the Technicolor plant in defective condition, or else the print he was using suffered a bad case of curl, and hence of focus-drift. The fact that the Technicolor print referred to was a short trailer inclines me to the latter view.

Trailers as a general rule are wound very tightly and with the inner convolution only about an inch in diameter. This makes for severe buckling, particularly when the print is wound up in this manner when brand new, when it is made on acetate stock, and when it has been exposed to moisture, causing the gelatine to expand slightly, thus "setting" the curl in the film.

"Actual drips of water" soaking into the roll of film can conceivably produce very annoying film-buckling—but this has nothing to do with mismatching of the three superimposed images of Technicolor.

Emulsion Same as in B-&-W

The emulsion of Technicolor prints is a single layer of thin bonding gelatine overlaid with the regular silver-containing gelatine emulsion for printing the sound track and frame lines. In short, Technicolor emulsion is *exactly* the same as regular black-and-white emulsion. In printing Technicolor it was formerly the practice to print the colors in this order: Yellow, Magenta, and Cyan. The dyes have a tendency to penetrate to a certain extent the dyes printed first—due to the fact that the dyes are formulated with chemicals having a strong affinity for hardened gelatine—and hence some of the Magenta penetrates the Yellow to give Vermilion-Red, which can be seen by scraping off the outer layer of Cyan.

A few years ago the Magenta and Cyan were transposed in the order of printing, resulting in a bottom layer of Emeraude-Green which becomes visible when the outer layer of Magenta is scraped off.

The Cause of 'Fuzziness'

It is true, therefore, that the three separate colors exist in ill-defined layers in Technicolor film; but the total thickness of these layers is probably only slightly greater than the thickness of reduced silver in black-and-white film. The definition of black-and white would therefore suffer almost as much as that of Technicolor if any slippage between top and bottom strata of film emulsion should occur. This, however, is a phenomenon I have yet to find even with water-soaked film. (Remember that all prints are considerably water-soaked between printer and projector.)

Now for the matter of "fuzzy" Technicolor, a condition which bedevils every projectionist at times. It might be thought that the Technicolor printing dyes "run" or spread a trifle in the gelatine of the positive film. They do. When images are printed from brand-new matrices, or printing films having the very sharpest photographic definition, microscopic examinations reveals that the Magenta dye "spreads" only slightly more than the natural graininess of panchromatic negative, the Cyan spreads about two times more than the Magenta, and the Yellow about three or four times more than the Magenta.

In other words, Magenta spreads the least and Yellow the most. But this spreading of the dyes in the gelatine of the positive film is not enough to be visible in the projected picture from even the front seats of the theater. Much more serious are two other causes of fuzzy Technicolor.

First is the matter of actual misalignment of the three color images during printing of a positive in natural color from three separate matrix films. Very rarely does a Technicolor print having poor registration come our way. In fact, most of those we have suffered through were printed in England—especially those carrying in addition to the three color images a fourth superimposed image in silver. The silver image was presumably added to maintain correct spectral balance in low-key scenes. However successful it may have been in this regard, it sure ruined the focus. G. B. Shaw's "Cleopatra" is a horrible example.

Printing From Worn Matrices

Next comes the most serious defect of all—printing from matrix films which

* "The Magic of Color," in five installments: IP for May-Sept., 1951, inclusive.

Season's Greetings

MOVING PICTURE PROJECTIONISTS
LOCAL NO. 486 I. A. T. S. E.
Hartford, Conn.

Season's Greetings
from
PROJECTIONISTS
LOCAL NO. 521
Long Beach, Calif.

Holiday Greetings

PROJECTIONISTS LOCAL NO. 650
Westchester County
New York

Season's Greetings
from
LOCAL NO. 414
Wichita, Kans.

have exceeded their useful printing life. In the old days it was possible to get about 50 prints from each set of matrices. For more prints new sets of matrices had to be prepared from the original negatives. The dye-soaked relief images of matrix films seem to get fuzzier and fuzzier as more and more prints are made from them. Naturally, a worn-out set of matrices produces a print so blurry as to annoy even patrons in the back rows.

It is no secret that Technicolor does not have such sharp images as the *best* black-and-white prints; but the process is being improved constantly. In its present state of perfection (in the United States at least) it often outstrips black-and-white in the matter of sharp images. On the whole, Technicolor is eminently satisfactory and well-managed here. Patrons never complain about Technicolor quality, whereas squawks sometimes arise as to the graininess, fuzziness, lack of good contrast, *etc.*, of black-and-white prints.

Trad Theater Tv—Motiograph

Motiograph, Inc., manufacturers of quality 35- and 16-mm sound projection equipment, is sponsoring an all-out promotional campaign to acquaint the theater field with the merits of the TRAD direct-projection theater Tv system. An elaborate booklet in color which gives not only the technical low-down but also the transcontinental relay facilities available to potential users has been sent to every theater in the U. S. and Canada.

The TRAD system is the lowest-priced in the theater Tv sweepstakes, its price of $8,950 including a one-year guarantee against failure of any component subject to normal usage. Motiograph states that full details of the TRAD system will be made available shortly, with particular emphasis being placed on the design and operational features which apply directly to the projectionist.

Projection Men Named SMPTE Fellows

Projection field notables who have been named Fellows of the SMPTE are Clarence S. Ashcraft, of the lamp manufacturing firm of the same name; Bill DeVry, president and E. W. D'Arcy, chief engineer, of the DeVry Corp., and Ed Stifle, of Eastman Kodak film department.

NPA Conservation Appeal

Under the general heading "Conservation of Film and Equipment is Urgent!" the National Production Authority has mailed to thousands of projection rooms an attractive colored folder urging conservation on all fronts. Excerpts from the folder are appended hereto.

The disregard of proper maintenance has been resulting in excessive damage to film and excessive demands for replacement parts.

REMEMBER—Projectors are made of critically needed materials. They MUST be properly maintained and serviced FREQUENTLY. Neglect results in needless waste, poor projection, audience hazard, and expensive film damage.

YOU CAN HELP REDUCE THIS WASTE!

Use the following checklist. It's for your own protection!

CHECK—

Sprockets frequently. Hooked sprockets, undercutting of teeth, and tooth breakage destroy film.

Tension springs, film guides and strippers for wear.

Take-up and feed tensions for proper adjustment.

Magazine rollers for wear. Jamming is common when they are neglected.

Bearings, gear trains, and other precision-made parts.

Keep all moving parts lubricated properly.

CLEAN—

UPPER MAGAZINE, fire trap, and rollers. Remove all dust, film fragments, excess oil.

PROJECTOR HEAD. Remove dust, film residue, oil drippings. Make sure that rollers and gate and tension shoes are thoroughly clean.

OPTICAL SYSTEM. Get the lenses clean and in proper alignment.

SOUND HEAD. Be sure it is immaculate throughout.

LOWER MAGAZINE, fire trap, and rollers. Remove all dust, film fragments, excess oil.

LAMP HOUSES. Their neglect is an inexcusable source of trouble and waste. Clean reflectors, condensers, rails, worms, gear tracks, lugs, and carbon holders. *Take out drippings and put them in your special container for salvage.*

START USING THIS CHECKLIST TODAY! THEN KEEP ON USING IT!

Pulse Rates and Death Rates

By DR. M. H. MANSON

Medical Director, Amer. Tel & Tel.

When a pretty nurse takes a man's pulse, chances are the patient is more interested in her big blue eyes than in his pulse rate. Few people think that a "fast" or "slow" pulse is of any great importance. Actually, as the speedometer which indicates how fast your heart is working, your pulse beat is something to watch pretty carefully.

At Johns Hopkins University in Baltimore, Dr. Raymond Pearl has discovered through study of thousands of pulse records that there is a definite relationship between pulse rate and length of life. Long-lived persons averaged two fewer heart beats a minute than shortlived persons. The healthy heart in an adult pumps about 70 times a minute, producing a pulse rate of 70 beats a minute. This adds up to 4,200 beats an hour, 100,800 a day, 36,792,000 a year. Nine to ten tons of blood go through the blood vessels, day in and day out.

Although you can't give the heart a full-time vacation, you can do much to ease its load. Suppose, for example, you cut down on your daily pace enough to save the heart two beats a minute over a year's time. This would actually give your heart the equivalent of a ten-day vacation. And a good night's sleep — eight hours—will save about 7,000 beats a day.

Season's Greetings

LOCAL NO. 337

I. A. T. S. E.

UTICA NEW YORK

— Greetings —

LOCAL NO. 224

I. A. T. S. E.

WASHINGTON D. C.

• Out-of-town visitors to IP officers: H. Paul Shay, Local 289, Elmira, N. Y., and secretary of the 10th District; Stewart Seifert, Local 203, Easton, Penna., and J. E. (Frenchy) Biencourt, business representative for San Antonio Local 78.

Movies Out of Doghouse, Says Big Biz Organ

FROM *Business Week*, that most competent observer of and reporter on the travails of *big business*, is culled the appended commentary on the economic health of the movie industry (*circa* Nov. 15 this year). One should bear in mind that the editors of this continuing compendium of men, money and affairs are people of sharp perception whose ears are attuned to the emanations from lower Manhattan—Wall Street, to be specific. Here's how they see it:

The jingling at Hollywood's box-office has caught Wall Street's ear. Movie attendance, which started picking up this summer, has leveled off at an encouraging figure, despite the return of the top Tv shows to provide competition. In recent weeks, quite a few brokerage houses have put out special market letters, suggesting that their customers should think seriously about buying the movie shares as a good speculation.

The argument runs like this: movie shares appear undervalued, compared with the market as a whole. Many of them yield from 8 to 10%. Dividends will be maintained, because higher box-office receipts and strict attention to cost-cutting make it almost certain that second-half earnings will be better than the mediocre figures reported earlier this year.

Hollywood Turns the Corner?

This means—so the argument goes—that Hollywood has turned the corner. It has adjusted itself to Tv. According to the optimists, the two industries eventually will enter into a profitable marriage. Some movie men think they may be able to use their lots to make Tv films, and old films carried on the books at little or nothing will bring in new revenue from Tv.

Analysts who are bullish on the movies go on to argue that people are now pretty well supplied with the durable goods they needed after World War II. From here on, they'll be able to spend more on nondurables, including movie tickets. They'll be tempted to spend more on movies, because Hollywood is making better pictures.

A lot of people who know Hollywood well refuse to believe that the major studios can make a cost-cutting program stick. Reports are that costs have been reduced from 25% to 33% below 1947. But there's an old saying that when the devil is sick he gets religion. If Hollywood has a string of successful pictures, will it continue to hold the line on costs?

Hollywood's 'Normal' Audience

Even if Hollywood does keep costs down that might not be enough. After all, nobody can be sure yet what Hollywood's "normal" weekly U. S. audience is going to be. According to the best available count, it rose to a peak of 80-million weekly in 1946, gradually dropped to as low as 53-million last spring, and has now leveled off at around 57-million or 58-million. Perhaps Hollywood may not be able to hang on to this 58-million.

Finally, suppose the movie makers do increase their profits? You can be sure that

when you use
SUPER-SNAPLITE
f/1.9 projection lenses

Yes "MOVIES ARE BETTER" and they're "BETTER THAN EVER" if you use Super Snaplite f/1.9 Projection Lenses. These superb lenses give you maximum light, maximum sharpness, and maximum contrast . . . maximum viewing satisfaction for your patrons.

True speed of f/1.9 in every focal length up to 7 inches.
Ask for Bulletins 207 and 209.

"You Get More Light with Super Snaplite"

KOLLMORGEN Optical CORPORATION
2 Franklin Avenue
Brooklyn 11, New York

the movie unions, as well-organized as any in the U. S., are going to demand a share of the take for their members.

Nearly as important as the cost-cutting program are the prospects of increased remittances from overseas. In prewar days, the movie makers used to say that the U. S. box-office paid for their costs, and the foreign box-office provided the profits. Lately, the companies have been getting larger remittances from overseas than previously.

The catch is: What will happen if the British, French, and other currencies go on weakening, as they have lately? You can expect that authorities abroad will slap on new restrictions to prevent loss of dollars.

Movie-Tv Nuptials

Furthermore, the coming marriage between Hollywood and Tv, though probably written in the stars, is still in the courting stage. The FCC might call it off, though chances are that it will be indulgent. FCC is scheduled to start hearings Jan. 15 on the proposed merger of American Broadcasting Co. with United Paramount.

There are a lot of other problems to be cleared up. When they have been solved, the movie business may be quite different from what it is now. The marriage with Tv may be profitable to some segments of the movie business. But it won't be profitable for all. For one thing, many of the smaller movie houses may disappear, forced out by big theaters with expensive large-screen and other features and by drive-ins.

Subscription-Tv Factor

For another, the $1-million-plus features made by Hollywood are scarcely suitable for home Tv as we know it today, unless sponsors can be found who will pay huge fees for a few minutes of commercial. That's not likely; so some kind of subscription Tv must be developed. Assuming that, later on, the "normal" Tv count will be 20 or 25 million sets, how many set owners can be relied on to pay 50c or $1 to see a new picture—once the novelty has worn off—when they can see older ones for nothing? If subscription Tv is financially successful, what will that do to the exhibitors?

Suppose the movie makers—or some of them—release their films to Tv not just the ancient ones, but films only a few years old? Won't that hurt their attempts to push subscription Tv? Can both approaches be profitable?

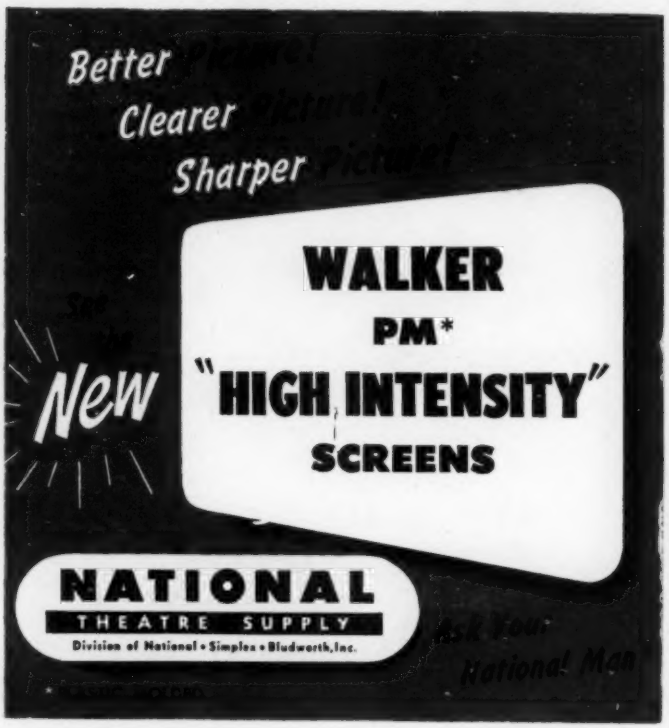
Legal obstacles have already popped up on the use of old films on Tv. Roy Rogers has secured an injunction forbidding Republic to lease his old films to Tv, though the case has been appealed. Gene Autry is filing a similar suit.

'Independents' on Their Own

All these problems could lead to something like this: The major studios, made top-heavy by their overhead, might be supplanted by independent producers who rent the big studios to make Class A films for, say, $100,000 to $150,000. They would have a lot more elbow-room in regard to subscription Tv and movie theaters. That is, they could make a profit on much smaller box-office receipts. The small studios might also develop along this line.

Or if subscription Tv doesn't succeed, some of the smaller movie-makers—and perhaps big ones, too—could perhaps eke out by making a big volume of half-hour or other short Tv films on low budgets, say $25,000. They might not make money on this, except in the sense that it cut their overhead on wasted studio space and unused time of salaried personnel. Perhaps they could help build up their own stars this way.

In this direction, Decca Records and Universal Pictures have merged. The main reason must be Tv. Universal has a subsidiary that has been making 16-mm home movies. Decca has 48 franchised agencies around the country that distribute Decca records. The subsidiary could make short films for Tv, and the agencies could sell them to local stations.



GPL 'Videofilm' for Gary, Indiana

Palace Theater, Gary, Ind., (2200 seats) will be the first Y. & W. Management Corp. house to theater Tv. General Precision Labs, through National Theater Supply, will install a "Videofilm" system which is expected to be in operation before year's end. Gary

has no Tv station, but being in the Chicago home set area, the Palace will hook into the main coaxial feeding Chicago.

Projection throw will be 125 feet, with a 46-amp arc projector pouring 4200 lumens through the 16-mm film.

IA ELECTIONS

LOCAL 150, LOS ANGELES, CALIF.

John Maynard, *pres.*; Geo. J. Schaffer, *bus. rep.*; Chas. A. Vencill, *sec.-treas*; Harold Angel, H. Clay Blanchett, Frank C. Champlin, Claire C. Piper, Hugh C. Smith, *exec. board*; Manuel Portillo, *guide*; Virgil Crowell, Hans (Deak) Freyman, E. J. (Red) Schmidt, *exam. board*; Duane E. Adams, Henry J. Kearney, Ray Richards, *trustees*; Magnus Nielsen, Clyde W. Shuey, Ralph L. MacDonald, J. Maynard, Wallace G. Crowley, Paul J. Mahoney, G. J. Schaffer, and C. A. Vencill, *del. to IA convention*. Elected to the *board of directors, Local* 150 *Club, Inc.*: Frank McBryde, G. J. Schaffer, C. W. Shuey, Leo F. Stockwell, C. A. Vencill, H. Angel, J. Maynard, Hugh C. Smith, H. C. Blanchett, R. L. MacDonald, P. J. Mahoney, and M. Nielsen.

LOCAL 173, TORONTO, ONT., CANADA

Jimmy Sturgess, *pres.*; Lou Lodge, *vice-pres.*; George Jones, *sec.-treas.*; Pat Travers, *rec.-sec.*; Wm. Covert, *bus. rep.*; Roy O-Connor, Arthur Milligan, Jack Hills, Norman Tanner, *exec. board*; Douglas Cameron, Bill Reeves, Jackie Harris, *trustees*; George Robinson, *tyler*; Solly Cohen, *sgt.-at-arms*; J. Sturgess, P. Travers, A. Milligan, N. Tanner, *del. to IA Convention*.

LOCAL 181, BALTIMORE, MD.

Sam Isaacson, *pres.*; Louis Sieber, George Matthews, Wilbur George, *vice-pres.*; Chester Towers, *rec.-sec.*; Tom Finn, *fin.-sec.*; Carroll Bayne, *bus. rep.*; William Lang, Jr., F. W. Fadum, Charles Grauling, *trustees*.

LOCAL 440, ST. JOHN, N. B., CANADA

Edmund A. Chase, *pres.*; Roy F. Burnett, *vice-pres.*; James A. Whitebone, *general sec. and bus. rep.*; Cecil D. Beesley, *rec.-sec.*; Alyere T. Wedge, *treas.*; Leslie A. Sprague, Rennie J. Foulds, Norman A. Peters, *trustees and auditors*; J. Whitebone, A. Wedge, J. Vincent Mudge and Louis E. Comeau, *del. to Trades and Labor Council*.

LOCAL 623, WEST PALM BEACH, FLA.

C. W. Crow, *pres.*; J. M. Bursey, *vice-pres.*; C. C. Dodds, *rec.-sec.*; E. H. Hite, *bus. rep.*; S. E. Bursey, *fin. sec. and treas.*; P. I. Truax, *sgt.-at-arms*; L. T. Crick, J. W. Cummings and E. H. Hite, *trustees*; R. J. Allison, J. C. Crawford, *del. Central Labor Union*.

Ansco Monthly 'Abstract' Bulletin

Originally intended solely for use by the company's research department, up-to-date information on photographic technical developments, literature references, new literature and new patents, is being published by Ansco, Binghamton, N. Y. "Ansco Abstracts," a monthly review of technical literature, is produced in mimeographed form

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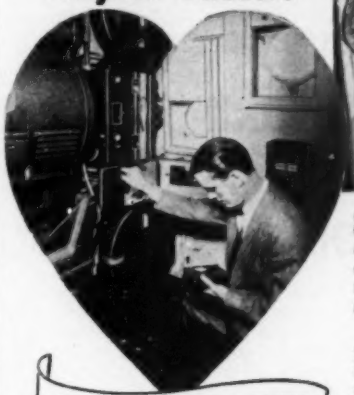

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to permit inclusion of the latest information—often as close as a few days after it becomes available.

Obtainable for $5 per year (outside the U. S. and Canada for $8) Ansco Abstracts, now in its 11th year, covers the various aspects of photography, including physics, chemistry, graphic arts, purely photographic items, applications of photographic principles in Tv radiography, medicine, etc. Patents are listed and reviewed in a separate section.

For additional information or subscriptions, address Library, Research Dept., Ansco, Binghamton, N. Y.

139,500 MPS—Believe it or Not

New technique developed by J. H. Park of the National Bureau of Standards increases "writing speed" of a high-voltage oscillograph to three-fourths the velocity of light. High intensification of the electron beam is obtained momentarily by superposing a steeply rising voltage pulse on the steady voltage applied to the discharge tube of the oscillograph.

The resultant increase in the intensity of the trace makes writing speeds up to 9100 inches per microsecond easily visible! These high writing speeds can be used to study rapidly varying electrical surges, such as are caused by lightning discharges, and to learn more about the insulation breakdown the surges produce.

Sic Semper Electronics!

Transitor development will be worth watching, as pregnant of big things for the future. There have been recent secret showings of this improved device to the Military. All laboratories are eager for inside info from the Bell Laboratories group doing transitor pioneering. Why? Because this little device could, in the years to come, spell the demise of the vacuum tube and transformation of the milti-billion dollar industry which has been built up around electrons in vacuo. *Sic semper electronics!*

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PROTECTING THE THEATRE—FIRST PLACE IN ENTERTAINMENT

WHO INVENTED MOVIES?

(*Continued from page 27*)

other investors have been repaid. Everyone working on the film—from artists to technicians—has deferred part of his salary or given his services free. The cast reads like a theatrical *Who's Who.*

The Film's 'Objective Outlook'

Although the cost of this Technicolor picture will nevertheless be about $900,000, all the cash that was required was less than $500,000. The Associated British Film Co. made studio space available on deferred operating costs. Technicolor and Kodak deferred 50% of their charges. British Lion will distribute at extremely low cost. All the major circuits will share the film.

In *The Magic Box* Britain seeks only to record the achievements of a sadly neglected scientist whose contributions furthered the phenomenal progress of motion pictures throughout the world. There is no desire to minimize the accomplishments of other cinema pioneers who worked in other countries. In order to

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maintain an objective outlook, the opening titles of *The Magic Box* are filmed against the statues of Edison and Marey.

FRIESE-GREENE A LEGEND In Which Informed Britons Do Not Believe

By TERRY RAMSAYE

SINCE I seem unintentionally to have created some international tension by my remarks about *The Magic Box* and its hero, William Friese-Greene, I avail myself of the opportunity to explain my real intention.

The publicity for *The Magic Box* clearly represented it as a film biography of William Friese-Greene and purported to establish him as the father of the cinema, and Britain as its homeland. Obviously, it was all a part of the brave, proud British Festival now being held in London.

I merely said in print that neither contention was supported by the facts—a conclusion I reached, and published, about 25 years ago.

Claims Unsupported by Facts

Some of the facts: William Green, a portrait photographer, was a smiling, friendly and amiable fellow, untutored in the sciences, given to fancies, beset by ambitions. When he married a Swiss lady, he sought escape from the commonplace by hyphenating her name to his and adding a decorative "e" to his Green. He had a genial picture gallery manner and spoke with warm plausibility. He probably believed in his claims.

Friese-Greene 'Unimportant'

At the request of the Society of Motion Picture and Television Engineers, I reviewed *Friese-Greene: Closeup of an Inventor*, by Ray Allister, which is the source document for *The Magic Box*, in its *Journal* for April 1949. In the course of the review I observed:

". . . Mr. Friese-Greene is credited [in this volume] with the original concept of principles recorded [and demonstrated long antecedent to his advent, including the work of Baron Franz von Uchatius, Louis Ducos du Haroun, Coleman Sellers and Henry R. Heyl of Philadelphia, and many another. His alleged and so-called prior presentations were not reductions to practise or demonstration of anything beyond the devices and methods of years before. . . ."

His American Foray

I might have gone into the intricate history of the optics and mechanics of the early art, but so unimportant a figure as Friese-Greene didn't seem to warrant doing so.

No British reader rose to complain *at that time.*

During the war conducted many years

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ago against the Motion Picture Patents Co. by the "Independents," Friese-Greene was brought to this country to testify as to his claims of priority. One of these "Independents" was Universal, and a man personally concerned in that company—P. A. Powers—told me that Friese-Greene arrived with nothing to support his claims, and that the "Independents" did not dare to offer him in court.

He sailed for home, to tell there tales of intimidation, including the assertion that he had heard threats to toss him off Brooklyn Bridge. He was, indeed, an uninhibited inventor.

Since then the curious assertion has circulated in Britain, and occasionally even in this country, that the United States courts broke up the Patents Co. by declaring for Friese-Greene's priority. There is no substantiation whatever for this. I have repeatedly demanded that the case and decision be cited. Expert patent lawyers know of nothing even approximating such a decision.

Cites a British Opinion

My London challengers hurl at me the statement that the technical consultant for *The Magic Box* is the able British authority R. Howard Cricks, the expert on technical matters for the competent *Kinematograph Weekly*, of London. My critics, however, do not reveal, as I have done elsewhere, that the *Kinematograph Weekly* for June 1, 1950, in answering some Russian claims of film priority, published a report from Mr. Cricks in the course of which Cricks said incidentally, but flatly, that Friese-Greene was not an important figure in the history of the cinema. The *Kinematograph Weekly* said in its report:

"In summarizing his evidence, Cricks admits that William Friese-Greene's contributions . . . are not very important. He considers that Edison, Paul and Lumiere played a far more important part."

Long ago I obtained from Robert W. Paul, of London, and Louis Lumiere, of Lyon, France, their personal stories. Both declared that their efforts had been based on the Edison Kinetoscope.

Patents Merely Claims on Paper

Much is made in the British claims about the many patents that Mr. Friese-Greene "took out." That means claims on

PROJECTIONISTS ALREADY HAVE TROUBLE ENOUGH

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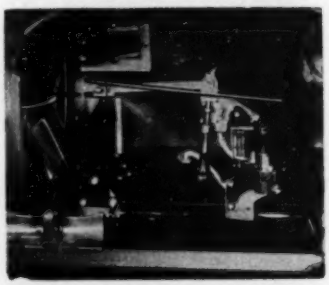

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Charles F. Wheeler, Sec.-Treas.

Peace on Earth—
Good Will to Men"

LOCAL NO. 253

Rochester, N. Y.

paper, not working, or even workable, machines. For instance: Friese-Greene "took out" a patent on the making and projection of stereoscopic pictures without a viewing device. He never did know the nature of stereoscopic vision, and he never demonstrated any such device.

Since the assault on me first began in Britain, the broad claims of Friese-Greene's fatherhood of the art have been importantly modified. The publicity agents now say they want merely to establish that Friese-Greene was an important worker in the field. That's a concession, but it is not enough.

Sentimental tinkering with the history of the motion picture in a motion picture is inexcusable. It has been my fate to spend a considerable part of an industrious life trying to clear the annals of the motion picture of their myths, misrepresentations and confusions. Those who have had a hand in *The Magic Box* have been motivated by laudable patriotic purposes, but these, alas, the serious historian cannot approve.

Dramatic Ending Spurs Legend

The career of Friese-Greene came to a dramatic end, which gave impetus to the legend of a great inventor dying unrewarded. Every industry has such a legend

Friese-Greene was living in penury in an attic room in London, still pathetically striving to invent. He decided to attend a general meeting of the cinema trade to discuss block-booking, about which Lord Beaverbrook was then campaigning. It is doubtful that he was invited to attend.

The meeting was stormy. When Friese-Greene rose to speak he faltered and mumbled. He was invited to the front of the hall, and there stood swaying, speaking in broken sentences and incoherence. He was helped down the aisle to his chair. He sat down, buried his face in his hands, and died.

The daily papers played it tremolo, using all the stops, and the legend was on its way.

Merely an 'Ingenious Mechanic'

Meanwhile, according to Mr. Allister's biography: ". . . the *British Journal of Photography* spoke of Friese-Greene as merely an 'ingenious mechanic' with 'a very hazy notion of the fundamental principles of chemistry and physics.' But then photographers had never loved Friese-Greene."

The fact that the British government is scheduled to pay £100,000 of the estimated total cost of £220,000 of *The Magic Box*, has political significance. *The Magic Box* certainly doesn't contribute to the glory of the Empire, nor to the art of the motion picture. Britain's history is too full of real achievements for the fanciful story of Friese-Greene to be exploited at Government expense at the British Festival.

Lest it be held that I am burdened with certain prejudices, as has been hinted, let me set down that I am of Norman-Scot extraction and have ever been aware of Britain's greatness and conscious of its role in the nurture of our civilization. Hence I would not deflate the sentimental claims made for Friese-Greene because of anti-British prejudices, but for the sake of the record.

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Gainesville Texas

PROJECTIONIST SHOWMANSHIP

(*Continued from page 8*)

most common trouble is faulty burning of the arc. Close attention to the operation of the lamp, even if it be a modern automatic-control model, is mandatory. A positive crater burned slantwise causes uneven and discolored screen illumination; too long an arc-gap causes the light to flicker and risks loss of illumination; too short a gap causes poor illumination, spindling of the carbons, and even risks cracking the mirror, as will now be explained.

But first a word about carbons. Don't store carbons in damp places. Carbons are porous and absorb moisture readily. A damp trim gives an extremely poor performance. Many times an unsteady and sputtering arc has been blamed on "a poor lot of carbons," when, actually, the carbons would burn excellently if only they were dried out before use. It is always a good idea to place a trim of carbons in or under the lamphouse, if there is room, and thus be sure of having a dry trim on hand. On the so-called "victory" carbons the copper coating is not thick enough to stand full current capacity. A few more wars, and we shall have no copper at all.

At first thought, there seems to be little connection between a short arc gap in a high-intensity lamp and a damaged mirror, but it is a fact that cracks in glass reflectors are usually caused not by unintentionally whacking them with pliers, but by accidental jamming together of the negative and positive carbons of H-I arcs.

Causes of Mirror Cracking

When the two carbons are jammed tightly together, a "trap" is created in which white-hot carbon gas—vaporized carbon—collects under pressure. The volatilized carbon cannot escape until the gas pressure is high enough to blow off the tip of the spindled, or pencilled, negative carbon. When this tiny explosion occurs, a stream of carbon gas is forcibly ejected toward the mirror and condenses upon the comparatively cool glass surface as a large spot of black soot. The mirror does not usually crack at once, but as soon as the reel has been run and the lamp turned off, conditions begin to develop which may result in a serious cracking of the glass.

Anything black, like soot, absorbs heat from the radiant energy, such as light and infrared rays, which falls upon it. A transparent medium, like glass, transmits heat; while a silvered surface, like the shiny surface of a mirror, reflects heat, not retaining much of it.

What happens when a soot-spotted mirror cools? The glass and silver become reasonably cool right away, and the glass contracts slightly as it cools. The heat-absorbing soot-spot, however, retains heat, radiating it away very slowly, thus preventing contraction of the glass on which it lies.

Emergency Mirror Service

Now, when one part of a glass mirror contracts, and another part is prevented from contracting—the part under the hot soot—a mechanical strain develops which ordinary glass cannot withstand. Result: a crack develops from center hole to outer adge.

A mirror, when it cracks, makes a noise like two hammers struck sharply together. It does not sound at all like glass breaking. So when the projectionist hears this unmistakable sound coming from the idle projector, he should at once examine the mirror and wipe off the soot. With only one crack in it, the mirror can be used for the remainder of the show. The light will be just as good as ever. *But*—and this is mighty important—the mirror should be replaced at the earliest opportunity, since the development of a *second* crack will cause the mirror to shatter completely.

When replacing the mirror in one machine, it is good practice to install a new mirror in the other machine, too, in order that the performance of the two projectors be exactly equal in quality. Money is saved by using only mirrors made of heat-resistant borosilicate glass, such as Pyrex. The initial cost is slightly greater, but they don't crack so readily.

[TO BE CONTINUED]

★

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Defense is your job, too. For the sake of all our servicemen, for your own sake, help make this land so powerful that no American again may have to die in war. Buy United States Defense* Bonds now—for *peace!*

Remember that when you're buying bonds for national defense, you're also building a personal reserve of cash savings. Remember, too, that if you don't save *regularly*, you generally don't save at all. Money you take home usually is money spent. So sign up today in the Payroll Savings Plan where you work, or the Bond-A-Month Plan where you bank. For your country's security, and your own, buy U. S. Defense Bonds now!

*U.S. Savings Bonds are Defense Bonds - Buy them regularly!

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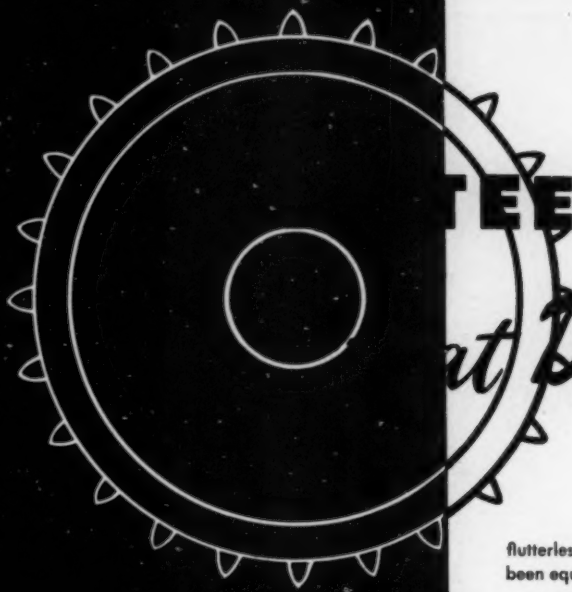


TEETH...

...at Don't Bite!

To guarantee projectionists an even, flutterless screen image, SIMPLEX X-L Projectors have been equipped with a revolutionary *24 tooth* sprocket!

...**24 teeth**—*8 more* than in ordinary sprockets!

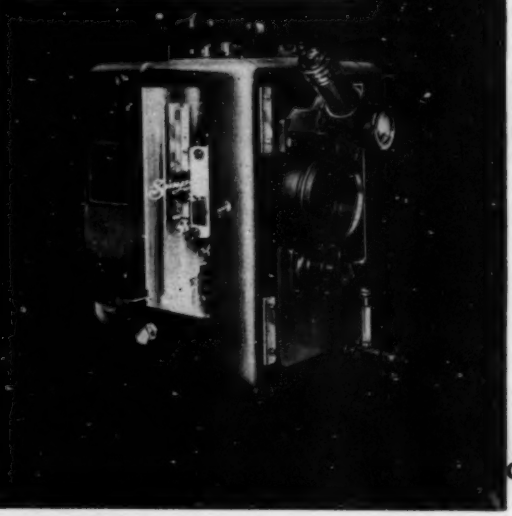
...**24 teeth** that draw film more smoothly, more gently along!

...**24 teeth** that reduce sprocket r.p.m. by one-third!

...**24 teeth** that save sprocket, stud and bearing wear!

...**24 teeth** that assure better performance, easier maintenance!

And this 24 tooth sprocket is found *only* in the SIMPLEX X-L! A perfect example of the many *exclusives* found in this, the world's finest, most dependable motion picture projector!



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